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THE HYGIENE OF THE SCHOOLROOM

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REVISED EDITION



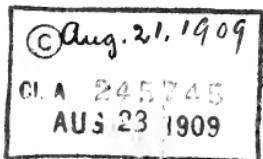
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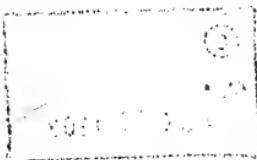
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“What will it profit a child to gain the whole world of knowledge and lose his own health?”





PREFACE

THE aim of the author in writing this book is to place in the hands of educators and others interested in child life trustworthy knowledge of the means of conserving the health of those entrusted to their care. Compulsory education, in this country, is almost universal, and it should be the duty of the authorities to see that in the schools which children are required to attend nothing of an unhygienic nature exists. It is the truth, however, that until very recently little attention was given to the physical side of the child's nature, and that in the school-room the fundamental principles of hygiene were very little understood—at least were not practised. Some matters, to be sure, that concern the pupil's health, such as the need of proper diet, of proper clothing, and of eye-glasses, are beyond the province of the school authorities, and can be reached only by advice to parents and

guardians. But many of the evils growing out of a common public school system are remediable: there can be, for example, better treatment of the problems of heating, ventilating and lighting. Upon these and kindred topics this book offers suggestions which the writer trusts will be of value to whoever is interested in improving the physical condition of the children in our schools.

A work of this nature is essentially for teachers, superintendents and school governing boards, and aims in all parts to be practical rather than to quote countless pages of statistics usually as various as the individual opinions of the writers. The author hopes to combine the consensus of the best opinion with personal knowledge and investigation and make clearer the much discussed subject of *School Hygiene*.

Preface to Second Edition

THE encouraging manner in which the first edition of "The Hygiene of the Schoolroom" was received has importance, principally, in showing a lively interest in all that tends to the pupil's physical well being.

School officials, generally, are evincing commendable concern in the modern construction of school buildings, ventilation, heating, lighting, school diseases, medical inspection and kindred subjects.

In many cities through their efforts medical supervision has been adopted, and, its benefits being so apparent and immediate, it has always found lasting favor.

Teachers have appreciated this volume as a reference book; as it makes their duty much clearer in many perplexing points of a scientific nature, which they must decide upon, yet which demand almost an expert's understanding.

As promised in the prospectus at the beginning of the year, the book was to be a practical treatise on all that

pertains to the health of the pupil. Upon its appearance it was eagerly taken up by educators throughout the country, many of whom have expressed their gratitude for the helpfulness it affords in the field it covers. Many, too, have added to the value of the second edition by timely suggestions and comment.

It is hoped that this book will help to keep alive the interest that is being felt in the preservation and promotion of the pupil's physical welfare.

The author trusts that it will be received with the same favor and appreciative criticism that was accorded the first edition.

WOONSOCKET, R. I., Nov. 1, 1904.

Preface to Third Edition

THE author is glad of this opportunity to offer an enlarged "Hygiene of the Schoolroom" in the third edition.

In six years school hygiene has taken life and energy in such measure as has been accorded no other department of child life study. If this work has been helpful in this impetus, the author counts himself well repaid, and if one child has been spared disease, he feels that his life work has not been in vain.

WOONSOCKET, R. I., June 1, 1909.

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DEFINITIONS

Hygiene is the branch of medical science which concerns the preservation of health.

School Hygiene is the application of a system of principles or rules designed to preserve the health of the pupil.

THE HYGIENE OF THE SCHOOLROOM

CHAPTER I

THE SELECTION OF A SITE FOR A SCHOOL BUILDING.

The selection of the site for a school has an important bearing on the hygienic condition of the building. The primary consideration should be the drainage capacity of the soil; if possible, the land should be high and dry. Marshes or springy land must be avoided, else, although the greatest care in construction be taken, dampness in the cellar will most certainly result, and even if all the precautions known to sanitary science are used in all other parts of the building, it will be impossible to overcome the evil effects of this dampness. There are many diseases which, while not due to dampness, are fostered and abetted by its presence, particularly diphtheria, typhoid fever, consumption and rheumatism. Headache and languor also frequently result from living in and breathing a damp atmosphere.

An instance of unwise selection of a site is noted in a New England town, where a schoolhouse was built on a

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side hill that was notoriously springy. More than twenty years have been spent unsuccessfully in trying to keep a dry cellar. Water forces itself in during the rainy season, filling the cellar bottom and leaving a grimy dampness on the side walls and a perceptible dampness in the rooms above. The result has been numerous complaints of rheumatism in the building and an unnecessarily high percentage of sickness.

Made ground, that is, land that has been filled in with ashes, rubbish, and animal and vegetable refuse, is undesirable school property. The air and moisture arising from such land are impregnated with foul and harmful gases, which are bound to make their way into the cellar; and, for a number of years, at least until the refuse is entirely decomposed, make such a neighborhood unhealthful. Where possible, a good gravel soil should be secured; if this cannot be had, then, in order of preference, a sand soil and sandy clay. Clay retains moisture very readily, and when a cellar is dug in such soil it is more than likely to be a damp one.

A school should be far from confusing noises, such as those made by railroad trains and certain factories. It is also unpleasant to be located near industrial establishments that constantly give off noxious odors. Furthermore, the lot selected for a school building should be

large enough to prevent neighboring structures from interfering with the necessary light. The building, as a general thing, should not cover more than half the lot. A good rule to follow is that no adjoining structure should be nearer than twice the height of the school building.

In laying out a schoolyard, at least thirty square feet should be allowed for each pupil. For instance, if a six-room building is to be erected to accommodate three hundred pupils, the playground should contain not less than 9,000 square feet. In the larger cities it will naturally be found difficult to have extensive grounds about the school building; but, wherever feasible, plenty of ground for play and exercise should be planned for.

Too often, however, hygienic conditions are ignored in the selection of a school lot and more mercenary considerations are allowed to prevail. Cost becomes a great factor in the decision, and often a school is located in one particular place because the land is cheap. Or the centrality of a site may determine the selection, or the dislike of property-holders to have a school building too near residences, the school being looked upon as a very poor neighbor. But the importance of a wise selection of land for a school should rise above all other factors in the decision, and the truth should be borne in mind that no lot is too good for school purposes.

CHAPTER II

THE CONSTRUCTION OF SCHOOL BUILDINGS

We shall consider the construction of school buildings entirely from a hygienic point of view. The general outlines and appearance of the building, and its interior adornment, have received exhaustive attention from architects; the artistic aspect of the subject we shall leave to those better qualified to do it justice. Within the past ten years, it is true, following the trend of other professions toward specialization, some architects have been giving careful study to school construction and have produced schools containing in the aggregate more sanitary improvements than had been worked out previously in as many decades. Experience, however, has shown that many architects have not as yet well handled the subject of school construction, and that too often such considerations as proper lighting and ventilation, proper location of cloakrooms and sanitary closets, are neglected.

The construction of school buildings, indeed, should receive as much attention from the sanitary officer as from the architect; and when the two shall work together,

we may hope to see ideal school buildings. We should bear in mind that such buildings would be as varied as the demands of different communities. The building that would fill the needs of a metropolis would not be suitable for a country cross-roads and vice versa. There are general rules, however, that apply in all cases.

The cellar should be so constructed as to be at all times dry; the top of the foundation should be at least three feet above the ground level, in order that plenty of light may be admitted to the basement. The floors should be of concrete or asphalt, and the walls of cement. The cellar should not be a foul, dark storage room for old rubbish, but a clean, ventilated, and well-lighted room that could be used in stormy weather with safety, as a playground for the children.

It is not wise to construct high buildings for school purposes for two reasons: first, stair-climbing is not a healthful exercise, especially for growing girls; and, secondly, in case of fire the danger is greater than in a low building. Buildings of two stories high should be the general rule; they should never be higher than three stories. The lowest grades should be assigned the rooms nearest the ground floor. In many of the larger cities the cost of land is such an important factor and the school population so dense that it is necessary to erect buildings of a number of stories in height. Of necessity

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the playground space is very limited, and for this purpose the roof is finished in such a manner as to afford a recreation place for the children. In such cases the sides of the roof are of course well protected by a high fence or wall to avoid accident during play. In many schools much pride is taken in these roof gardens, which are decorated with flowers and plants, affording pleasant places for the children's recreation.

The school entrances should be large and sufficient in number. The corridors must be roomy, and, with the stairs, should be fire-proof, even though the rooms themselves are not so. The stairs should be at least five feet wide, built with a landing near the middle of each flight. The steps should be of uniform box-like shape and of equal width: triangular steps and steps over eight inches high are to be avoided.

The cloakrooms or wardrobes should not be a part of the schoolroom. This latter point should receive particular attention, as there can be no question that the outer garments of the children are a favorite hiding place for disease germs. Personal observation has shown that in houses where contagious diseases exist, the outer garments receive little or no attention, and often form part of the covering of the sick one. When the patient recovers, these same garments, so pregnant with disease, are taken to the common cloakroom and huddled



FIG. 1.

Standard School Wardrobes in a School Hall.

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together with dozens of others, which thus become a most excellent medium for transmission of disease.

A model cloakroom should be separated from the schoolroom and connected with the corridor. It should contain individual compartments, or lockers, for each pupil's garments, and windows should be so arranged that a constant supply of fresh air may circulate freely about the clothes and rid them of the disagreeable stifling smell that so often clings to them and fills the schoolroom. The cloakroom should not be kept warm, as germs thrive and multiply much more rapidly in a warm room than in a cold one.

In several schools in England there are drying closets attached to the cloakrooms, for use on damp and rainy days for drying the wet shoes and outer wraps of the pupils. This most excellent arrangement could well be imitated in this country. Along this same line, it would be of great service, especially in times of epidemics, to have a small air-tight closet or room where garments, books, and all other articles brought from home to school, could be thoroughly fumigated. Successful fumigation can easily be done with formaldehyde vapor and with a comparatively inexpensive apparatus.

If at all possible, bathroom accommodations should be provided for the scholars. Recently, six new school-

houses opened in Boston had well appointed bathrooms. The teachers reported their use to be advantageous, that the daily bath was invigorating as well as cleanly, and stimulated the pupils to better work.

The children coming from the poorer homes formerly were denied these advantages, and often their bodies emitted odors which, taken in the aggregate in the school-room, were decidedly unhealthful and made a room difficult to ventilate satisfactorily. The use of the school-bath obviated this unpleasant feature.

The swimming tank is most to be desired, as in addition to its sanitary advantages it is helpful as a means of beneficial exercise. The matter of expense often stands in the way of its adoption, and if its introduction is not feasible the ordinary bath tub, or shower bath, is an efficient substitute.

The proper placing of water closets is an exceedingly difficult matter, and even experts differ widely on this point. Some favor placing the closets in the basement or elsewhere within the building; while others find positive objection to having the closet placed any nearer than fifty feet to the main building. Much can be said on both sides. If closets are placed in a cold, bleak part of the lot, many children will refuse to respond to the call of nature, and will suffer the ills attendant on such delay—constipation, hemorrhoids, etc. On the other hand,

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there is difficulty if the closets are in the building. For example: a modern schoolhouse lately examined in a New England town was found to have been most carefully planned—well lighted, well ventilated—and a model school building, save in one respect. On warm days in summer, and in winter when a strong fire was kept in the basement, an odor of urine permeated the whole building. The boys were undoubtedly careless, and the waste pipes failed to carry off the excreta quickly enough. The best plan is to have the closets connected with the basement and yet not in it, and supplied with their own ventilation and light.

The important desiderata in a plumbing system in school buildings are the rapid and thorough removal of the waste, and the establishment, by means of proper fixtures, of a complete barrier to the noxious odors and gases. Where the system is slow in carrying off the waste, decomposition of the sewage takes place and sewer gas forms. School children are noticeably careless in the use of closets, and for this reason many schools, particularly those for children of the younger grades, from first to fourth, have a system that performs automatic flushing of the closets every five, ten, or fifteen minutes during school hours, according as the mechanism is adjusted.

This automatic flushing principle may be applied to the individual closets, or to the latrine system, which is a large trough-like repository filled with water over which a number of seats are placed. The waste products are deposited in these troughs and are washed out automatically every fifteen minutes or half hour, or at the janitor's convenience.

The objection to an automatic flushing device of any description, is that it is very frequently out of order, and that unpleasant odors are about the closet until the flushing takes place.

It can be said, without reservation, that the best closet for all grades of children is the one that flushes every time it is used, either by means of the chain and pull or the mechanism that operates when the weight of the body is taken from the seat. There are many closets that have all the desirable points, but the principal trouble seems to be in finding a satisfactory urinal for the boys. This should be constructed of slate and should be trough-like in shape, with a continuous and strong flow of water through it. The floor should be of slate for at least six feet from the urinal, and this part requires continual flushing and cleansing, as investigation shows that often the floor about, rather than the urinal itself, is the source of the odor.

A system that commends itself to some and is in practical use in American cities, disposes of the excreta by

burning. The waste products are deposited on an iron receptacle and at regular intervals a fire is built underneath in a grate, the flue of which is connected with the chimney. The heat rapidly consumes the products, which pass up the chimney in smoke and gases. This is not a system to be praised and should be thought of only where sewerage is impossible. In country towns, of necessity, the closet must be the old-fashioned earth closet in a remote part of the lot; and with a very little care in covering in frequently with dry earth or ashes, it serves its purpose admirably. The teacher should never be reticent in speaking of the care of the closets, whether they are in the building or apart from it. Pupils should be taught that nuisances in such places will not be tolerated, not alone from a moral point of view, but from a sanitary one as well.

If possible, there should be in each building a room for gymnastic purposes. A favorite place for this with many architects is the basement, and if this part of the building is properly constructed and is light and dry, it will not be an undesirable location. Here regular gymnastic work and exercises under the supervision of the physical instructor can be carried out. A classroom with its desks and seats provides quarters too cramped for the physical instruction work. The best shape for an exer-

cise room, as for any schoolroom, is an oblong, the longer side being that through which the light is admitted.

Many states have carefully drawn specifications that must be carried out in school construction to guard against fire and overcrowding. In Massachusetts, "the law requires that a copy of the plans of every public building shall be deposited with the inspector of factories and public buildings of the district in which such building is located before the erection of the building is begun, which plans shall also include the system or method of ventilation to be provided, together with such portion of the specifications as the inspector may require. The plans usually required are a plan of each floor, including the basement and the attic, if the attic is occupied, and a front and a side elevation, and also plans and sectional detail drawings of the system of ventilation. Further plans may be required by the inspector if deemed by him to be necessary.

"In planning buildings to be used for schoolrooms, or places of assemblage above the first story, provision should be made for at least two stairways, and such stairways should be as far apart as practicable. No such stairway should be less than four feet wide in the clear, and winding steps should be avoided. The height of rise and width of tread of all stairs, measured on the cut of the

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stringer, should be given on the plans. No flight of stairs should have more than fifteen steps between landings. The main stairways from places of assemblage should have a width of not less than twenty inches for every hundred persons accommodated therein. Such stairways should be railed on both sides. All outside doors to such buildings should open outwardly."

In order to prevent fire, the Massachusetts building law makes further specifications as to the construction details of buildings, as follows:

"All elevator wells and light shafts, unless built of brick, must be filled in flush between the wooden studs with fire-proof materials, or lined with metal, or plastered on metallic lathing, as may be directed by the inspector, and all woodwork inside of such wells or shafts be lined with tin plate, lock-jointed. Where floor beams rest on partition caps or on girders, wall girts, or on wooden sills [the space] between such beams from the caps, girders, girts, or sills, to the lining floor above [must be filled in] solid with brick and mortar or other fire-proof material. When floor beams in frame buildings rest on ledger boards, each floor [must be thoroughly fire-stopped] with brick and mortar resting on bridging pieces cut in between the studs, or, where practicable, on the ends of lining floor. In brick buildings the space be-

tween the furrings on the outside walls or brick partition should be filled flush with mortar for a space of five inches in width above and below the floor beams of each story. Where basement or other flights of stairs are enclosed by partitions of brick or wood, the spaces between the studs or wall furrings must be so fire-stopped with brick or mortar as effectually to prevent any fire from passing up between such studs or furring, back of the stair-stringers. The soffits of all such enclosed stairs, and also partitions on stairway side, must be plastered on metal lathing. Where a building is occupied above the first floor for any purpose [insert statement of purposes referred to], and the lower story is occupied for stores, or other purposes not connected with the upper floors, the stairways leading to such upper floors must be enclosed with brick walls or with wooden partitions filled solid with brick laid in mortar or other fire-proof material, and plastered on both sides on metallic lathing, and all doors in such partitions lined with tin plate, lock-jointed. All long flights of stairs [must] have two smoke-tops in each flight, properly constructed. No pipes for conveying hot air or steam can under the law be placed nearer than one inch to any woodwork unless protected to the satisfaction of the inspector by suitable guards or casings of incombustible material. No wooden

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flue or air-duct of any description can be used for heating or ventilating purposes. A space of at least one inch [must] be left between all woodwork and the chimneys; also around all hot air, steam and hot water pipes; these spaces around chimneys and pipes, where they pass through floors, [must] be stopped with metal or other fire-proof material, smoke-tight. Steam and hot water pipes [must] have metal sleeves and collars. All channels and pockets for gas, water and soil-pipes [must] be made smoke-tight at each floor. The space around all metal or brick ventilating ducts must be fire-stopped at each floor with metal or other fire-proof material, as approved by the inspector. All chimneys [must] be plastered with one good coat of brown mortar, on the outside of brickwork, from cellar to roof. The ceiling of furnace or boiler and indirect radiator rooms must be plastered on metal lathing. There should be not less than one foot in height of open air space between the tops of furnace or boiler casing and the ceiling. The entire cellar ceilings of schoolhouses and other buildings used for public purposes should be plastered on metallic lathing."

CHAPTER III

VENTILATION

In spite of the fact that the subject of ventilation has received exhaustive treatment from writers on school sanitation, that the dangers of ill-ventilated rooms have been repeatedly pointed out, and that systems of ventilation have been elaborated and perfected, there are countless schoolrooms occupied daily in which the air is not so pure as in an ordinary stable. Many of these are in buildings constructed long ago, when no one thought of providing any other means of changing the air in the schoolroom than the doors and windows offered. Such buildings are hard to ventilate without causing serious discomfort to those who are seated near the open door or window, and, in consequence, the schoolroom too often goes unaired. But not only in old-fashioned schools is the supply of fresh air inadequate or neglected: even to-day schoolhouses are being built with little or no regard to ventilation.

There can be no excuse, however, for disregarding the dangers of having children live in an impure atmosphere:

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sanitary literature teems with warnings. The New York Board of Health estimates that forty per cent. of all deaths are attributable directly or indirectly to bad air. Dr. A. N. Bell, of Brooklyn, N. Y., in a paper read before the Public Health Association of Philadelphia, says: "The depressed state of the organism under the prevailing conditions of a badly ventilated schoolroom not only predisposes to epidemic diseases, but the liability to and the danger of all diseases are intensified; and vicissitudes of weather, which under favorable circumstances may be encountered with impunity, under these depressing influences become dangerous perils; and doubtless much that is attributed to the season of the year supposed to be predisposing to scarlet fever, measles, whooping-cough, diphtheria, and some other common affections of children, is due to the same cause."

Dr. James Johnson, in his "Diary of a Philosopher," says: "All the deaths resulting from fevers are but as a drop in the ocean when compared with the number who perish from bad air." Nor can there be any doubt of the value of proper ventilation. Prof. S. H. Woodbridge, of the Massachusetts Institute of Technology, in his notes on "Ventilating and Heating," makes clear the effects of the introduction of a system of efficient ventilation when he tells us that by this means "death rates

have been reduced in children's hospitals from fifty to five per cent.; in surgical wards of general hospitals, from forty-five to thirteen per cent.; in army hospitals, from twenty-three to six per cent., and in prisons, from eighty to eight per cent.”; and Dr. Oliver Wendell Holmes, in his “Medical Essays,” is responsible for the statement that “a simple measure of ventilation proposed by Dr. John Clark had saved more than sixteen thousand children’s lives in a single hospital.”

Between good air and bad there is more difference than might be thought. Chemically fresh air consists of

79 per cent. of nitrogen,*

20.96 per cent of oxygen,

.03 per cent. of carbon dioxide (carbonic acid gas), with traces of ammonia (nitric) acid and watery vapor.

Expired air contains:

79.2 per cent. of nitrogen (very little change),

15.4 per cent. of oxygen (a loss of over five per cent. of this life-giving element).

4.3 per cent. of carbon dioxide (an increase of over one hundred fold).

Carbon dioxide in excess in the air is not poisonous, as was formerly believed, although when a great deal of

* One per cent. of what was considered nitrogen is another elementary gas, argon.

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this gas is present, as in the air at the bottoms of wells, the air is irrespirable.

But air also contains volatile organic substances, which the skin—by a so-called “insensible sweating,” not necessarily accompanying moist perspiration—and the lungs give off. These organic exhalations, which can be readily detected by the nose when one comes into a close room where a number of persons are sitting, are the deadly principle in vitiated air. To illustrate the poisonous nature of the exhalations from the body, the following fact is cited: A four-year-old child, because of his good health and physique, was selected to represent the Infant John the Baptist in an allegorical posing. The child was stripped, and, to heighten the effect, his entire body was covered with gold bronze. The exhibition lasted several hours, but when the fête was over no effort was made to remove the coating and the following day the child died. The covering applied to the body sealed up these organic substances, which were absorbed into the system and caused the child’s death. And that the substances given off by the lungs are actively poisonous has been shown by Brown-Séquard. He found, upon taking the exhaled vapor, condensing it into liquid form, and injecting it into the artery of a rabbit, that death followed in less than a minute. Certainly these same toxic

substances in circulation in the air to an abnormal degree must act deleteriously.

Pupils soon show the evil effects of breathing impure air. Many tire quickly in school, although they are able to work with ease on the same tasks at home. The teacher notices that although the children work quickly and brightly during the first period of the day, an undesirable transformation takes place after only a short time in the vitiated, unhealthful atmosphere. The child finds difficulty in application, is much less able to follow out a line of thought, and becomes dull, fretful and irritable. And there can be no question that many of the headaches attributed both by parents and by physicians to eye-strain and too close application to study, are the result of improper ventilation of our schoolrooms.

The problem seems simple enough, for there is plenty of fresh air in the world. The difficulty is in bringing about a continuous and regular exchange of pure for foul air in school buildings without causing drafts.

But before considering the practical means of ventilation, we should estimate the proper amount of air space required. A conservative and yet a safe allowance, supposing the schoolroom to be twelve feet high, would be twenty square feet of floor space for each pupil. Thus a room 25 feet x 30 feet, giving an area of 750 square feet,

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would suffice for 38 pupils. Each pupil would have a cubic air space of 237 feet, which is very near the generally recognized standard.

There are two methods of ventilation: the so-called natural method, by which fresh air is admitted directly to the schoolroom from outside by means of windows, doors and other openings; and the artificial, by which a definite amount of air is first warmed, and then, by means of special appliances, introduced into the room, being finally removed when no longer respirable. Two systems of artificial ventilation are in use: the gravity system, by which the currents of air are kept in motion by the difference in the weight of cold and hot air; and the fan system, by which the air is circulated by means of a forced draft from a rotary fan. As to the relative merits of the natural and artificial methods, there can be no question—the latter is always to be preferred. By either the gravity or the fan system it is easy to supply 2,000 cubic feet of air to each child per hour (or, as the Massachusetts standard requires, 30 cubic feet per pupil per minute); with only doors and windows it would be impossible to supply this amount without creating strong and uncomfortable drafts.

In 1881, Mr. Richard Briggs, a civil engineer of Bridgeport, Conn., made an elaborate series of experi-

ments for the purpose of determining at what position in a schoolroom the inlets and outlets should be placed, in order to produce the most thorough change of air in a given time. The result of these experiments was the establishing of the principle that the warm air should enter the room from the inner walls, at a point six or eight feet from the floor, and that the foul air should be taken out from the bottom of the room on the same side. The results obtained from these experiments were published in the report of the Connecticut State Board of Health for 1881, and the system there recommended was employed with great success in the Bridgeport High School, which was built the same year.

The Code of Regulations of the Educational Department in England contains the following rules to be observed in planning Public Elementary Schools: "Apart from windows and doors there should be provisions for copious inlet of fresh, also for outlet of foul, air; the best way of providing the latter is to build for each room a separate air chimney carried up in the same stack with the smoke flues. An outlet should have motive power as by heat or exhaust, otherwise it will frequently act as a cold inlet. The principal point in all ventilation is to prevent stagnant air. Particular expedients are only subsidiary to this main direction. Inlets are best placed

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in corners of rooms furthest from doors and fireplaces and should be arranged to discharge upwards into the rooms. Inlets should provide a minimum of two and one-half square inches per child, and outlets a minimum of two inches. All inlets and outlets should be in communication with the external air. Rooms should, in addition, be flushed with fresh air about every two hours. A sunny aspect is especially valuable for children and important in its effects on ventilation and health."

The teacher who is fortunate enough to find herself in a building equipped with modern ventilating apparatus has little to think of on this score beyond familiarizing herself with the practical workings of the system; for the janitor may not always be at hand in an emergency, and the teacher then needs to know how to operate the apparatus herself. In some cases, for example, where fault was found with the performance of one or another system of warming and ventilating, the trouble was found to lie in the ignorance of the teacher, who had closed the wrong openings. But properly managed, a good system of artificial ventilation will very considerably lighten the all too heavy burden of the teacher's responsibilities.

If artificial ventilation is not or cannot be installed, however, there are improvements that may be made upon the old-fashioned practice of opening wide the doors

and windows. When windows have to be used without any fixtures for interrupting the direct flow of the outside air, much less discomfort to the pupil will result if they are opened from the top. But it is wrong to expect proper ventilation in a crowded room from doors and windows alone. Accessory means can be easily established, as, for instance, by making several openings for the exit of air around the top of the room, and others for the entrance of air at the bottom. These openings should be provided with registers that can be opened and closed at will. If it is necessary to use the windows, it is desirable to employ some form of the numerous window ventilators in use. Some are merely plain strips of board fitted underneath the lower sash, allowing the air to enter upwards between the sashes. Others are wooden pieces perforated in such a way as to direct the current of entering air upwards. Another is a device of glass after the fashion of a Venetian blind. An excellent adjunct appliance, efficient in its place, but hardly large enough to supply all the air required in a schoolroom, is a ventilator made of glass enclosed in a wood or metal frame, fitting any ordinary window and placed in adjustable brackets at an angle of from five to twenty degrees. It can be readily adjusted parallel with the window, and can be attached or removed without causing any defacement to window

sash or frame. By its means, the fresh incoming air is deflected towards the centre of the ceiling, where it meets the warmer air, with which it becomes thoroughly mixed. In this way a good, free circulation is produced without subjecting persons in the room to drafts.

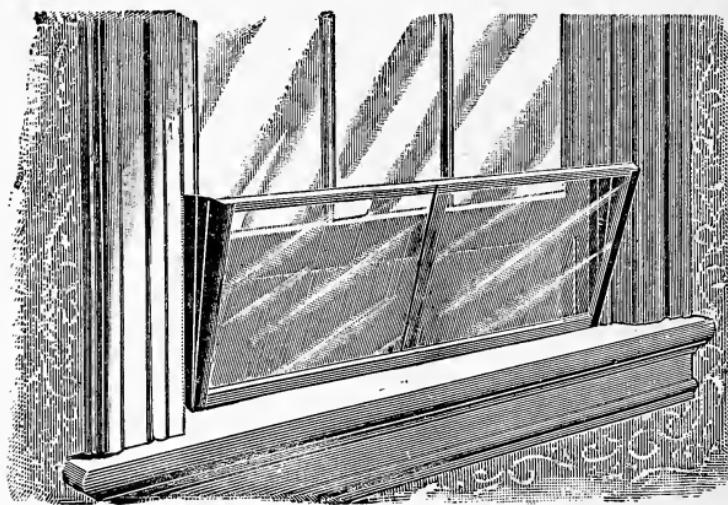


FIG. 2.

There are numerous tests for determining the relative amount of impurities in the air, but as all are very difficult to perform with the material at hand in an ordinary schoolroom, they are left for text-books on the subject of ventilation.* The teacher will seldom need to use anything but her olfactory nerves to determine that

* In this country Mr. Gilbert B. Morrison has a very carefully prepared and valuable work on this subject.

the ventilation is bad. The odor from the impurities of the air will often be increased by the odor of fetid discharges from the ear, of decaying teeth, and of sweaty feet; and the teacher should have no hesitation in searching out the source of such annoyances, and seeing that they are remedied as soon as possible. In all these cases, with the possible exception of prolonged discharges from the ear, cleanliness is all that is required. An unpleasant odor from a chronic ear trouble should be a sufficient cause for the excusing of a child from school. The air must be kept pure and sweet at all costs, and the teacher, in addition to seeing that the artificial ventilation works as it ought, should seize every opportunity, as at recess and lunch hour, for thoroughly renewing the air by opening doors and windows.

At this point it would be well to insist that the abolition of the old-time ten or fifteen minute recess was a serious error. It offered an excellent opportunity to air all the rooms thoroughly and afforded a breathing spell for the pupils. There was also time to give the tired brain a rest, to ease the eye strain, and to relax the wearied and cramped muscles. But within the past few years the recess in many schools has been abolished as being old-fashioned and exceedingly difficult to carry out, because it interfered with school order. The omission of the

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recess shortened the day's work of the teacher, it is true, but it took from the pupil a very refreshing period. The school hours should be interrupted during both sessions for fifteen-minute recesses, or when there is but one session, there should be a recess of no less than thirty minutes. In Germany there is a legal requirement demanding forty minutes intermission, exclusive of gymnastics, for every five hours of school work.

Governor Peck, of Wisconsin, once wrote an article on the abolition of the recess in his own characteristic manner. He says:

"Sometimes it looks as though the school officials were overdoing the thing in trying to make the schools of the present day as different as possible from the old schools, where the fathers and the grandfathers got their education. The last 'improvement' that is suggested by school boards in some places is to do away with the recess in the middle of the forenoon and the middle of the afternoon, thus compelling the scholars to stay in the heated schoolroom from 9 o'clock in the morning until noon, and all the afternoon without a minute of rest. If the abolition of the recess does not raise up a race of people with nervous headaches it will be a miracle. The old recess! Good gracious! it was the recess that kept the boys and the girls from dying in their tracks.

"The recess in school is like the sherbet served in the middle of a banquet; it aids the digestion like the blanched almonds and the celery and the olives. If the banqueter sat and ate of the solids all an evening, and never had the rest that comes with the et ceteras, he would die of apoplexy before the speaking began. If the scholar studies all the time until his head whirls his brain will become clogged. When you stop the recess you might as well seal up the brain and put it in a bottle of alcohol. The boy and the girl have got to have a time to cut the string that holds the cork down, and let the wolf howl."

CHAPTER IV

HEATING

The temperature commonly accepted as proper for a schoolroom is 68° F., and should not be allowed to rise over 70° F. Two thermometers should be placed in the extreme corners, as the temperature at the forward part of the room, if heated by a stove, or at the registers or radiators, will often be above the required point, while that of the distant parts of the room is considerably below. The temperature should not vary more than three degrees in any part of the room.

Residences, places of business, factories and school-rooms are ordinarily kept too warm, often at 80° F.; and children who are accustomed at home to a temperature of 80° F. will find discomfort in sitting in the schoolroom at 68° F. But constant living in such an overheated atmosphere renders one unable to stand any exposure without contracting colds and catarrhal affections. It has far more to do with the great increase in New England of such affections than has the much-blamed changeable climate. Indeed, many hygienists of repute, principally

Europeans, advocate a much lower average heat in the schoolroom than that here suggested, some recommending a temperature of 61° F., and others a temperature even as low as 50° F. In America conditions are different, and it would not be wise to keep the minimum temperature under 68° F. One cannot suffer from cold in a room at 68° F.; yet temperature taken in over seventy schoolrooms during the winter months averaged 78° F., ranging from 65° F. to 85° F. in several rooms. In some instances, when too great a degree of heat was found, the teachers confessed to liking a very warm room. However, personal preferences should be dropped in the interest of the school as a whole; and this interest, we repeat, is best served by maintaining a temperature which does not vary more than two degrees from the normal point of 68° F.

Every school should have its rules regulating the temperatures of the room in cold weather. If, at the opening of school work, the thermometer does not register 60° F., the school should be dismissed. If the thermometer is 60° F. or thereabouts, with a probable rising temperature, the pupils may be kept without danger. The first part of the day's work could be advisedly given to physical exercises.

The methods of supplying heat are two, direct and indirect. By the direct system the heat-supplying force is

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contained in the room itself—a stove, an open fireplace, or the radiators of a steam or hot water plant. When a stove is used, great care devolves upon the teacher to see that no gases are given off and that a steady, constant heat is furnished, not too intense for those nearest the stove. For their protection, it is a good plan to use fire screens. In a small building, the open fireplace can be advantageously used, since it also serves as an excellent means of ventilation. The principal objection to the open fireplace is the great waste of heat in the chimney.

The indirect system consists in warming fresh air outside the room and introducing into the room the air so warmed. At present three methods are in general use—steam, hot water, and warm air furnaces. Each of these methods has many advocates and is vigorously upheld as the best. One or another of the indirect systems should always be used when possible, as a more equable temperature can be kept and results in less distraction to pupil and teacher. In a steam plant, the fire heats the iron, the iron the water; steam is generated and is conducted from the boiler to the heating chamber, in which it heats iron again, and the iron then warms the air for distribution. The action of a hot water system is similar, except that steam is not generated, and that the water is conducted to the heating chamber at a lower tem-

perature, necessitating a much greater radiating surface to warm the same amount of air. In the warm air furnace the fire heats the iron, and the iron warms the air, which then passes directly to the point of distribution.

The choice of a system of indirect heating will vary with the size of the building. A two, four or six room building can be heated very readily with a hot air apparatus. A building with more rooms requires a steam or hot water heating plant or a combination of hot air and steam.

An important point favoring the hot air furnace, where available, is the simplicity of its operation. The ordinary janitor for a school building is too often selected because of his inability to perform any other work in the community. Instead, one who has charge of a heating apparatus that might by neglect become a source of danger, should be a carefully selected man, fully equipped

NOTE. The manner in which the children are fed and clothed has a great deal to do with their power to withstand cold. Examinations made during the winter months showed that a number of pupils were very scantily clothed. Some had no undervests and the other garments were of the flimsiest nature. The teacher should, of right, investigate such matters as these, and if, as is often the case, the parents are unable to remedy the matter, it should be called to the attention of the superintendent to report to the poor commissions. Badly-worn shoes and wet feet should be looked after and no pupil should be seated at the daily work who has wet feet. Some means of drying the shoes and stockings should be devised, as there is nothing more harmful than sitting for hours with damp and wet feet.

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for all the branches of his work, and invariably sober and industrious.

The following requirements in regard to heating (and ventilating) apparatus are enforced by the state of Massachusetts :

1. That the apparatus shall, with proper management, heat all the rooms, including the corridors, to 70°F in any weather.
2. That, with the rooms at 70° and a difference of not less than 40° between the temperature of the outside air and that of the air entering the room at the warm-air inlet, the apparatus shall supply at least thirty cubic feet of air per minute for each scholar accommodated in the rooms.
3. That the supply of air shall so circulate in the rooms that no uncomfortable draft shall be felt, and that the difference in temperature between any two points on the breathing plane in the occupied portion of a room shall not exceed 3° .
4. That vitiated air in amount equal to the supply from the inlets shall be removed through the ventiducts.
5. That the sanitary appliances shall be so ventilated that no odors therefrom shall be perceived in any portion of the building.

CHAPTER V

SCHOOL FURNITURE

The average child is employed at school work during the years from five to fifteen. This particular period is the growing, or formative, age of the child. Many of the bones by the fifth year are in a very imperfect state of development; a considerable portion of each bone is still composed of cartilage, which is very easily moulded into or out of shape. In succeeding years the bone more and more displaces the cartilage, and not until about the age of puberty are the long bones and spinal column fully matured. Habit during this formative period will yield permanent after-effects of either good or evil, as the case may be.

At this time in life children should be taught to stand correctly, to walk correctly, and to sit correctly. In standing, the shoulders should be thrown back, the chest extended, and the head held erect. The heels should be together, the toes extended, and the weight evenly distributed upon both legs. In walking, the same correct posture should be maintained and an effort made to take

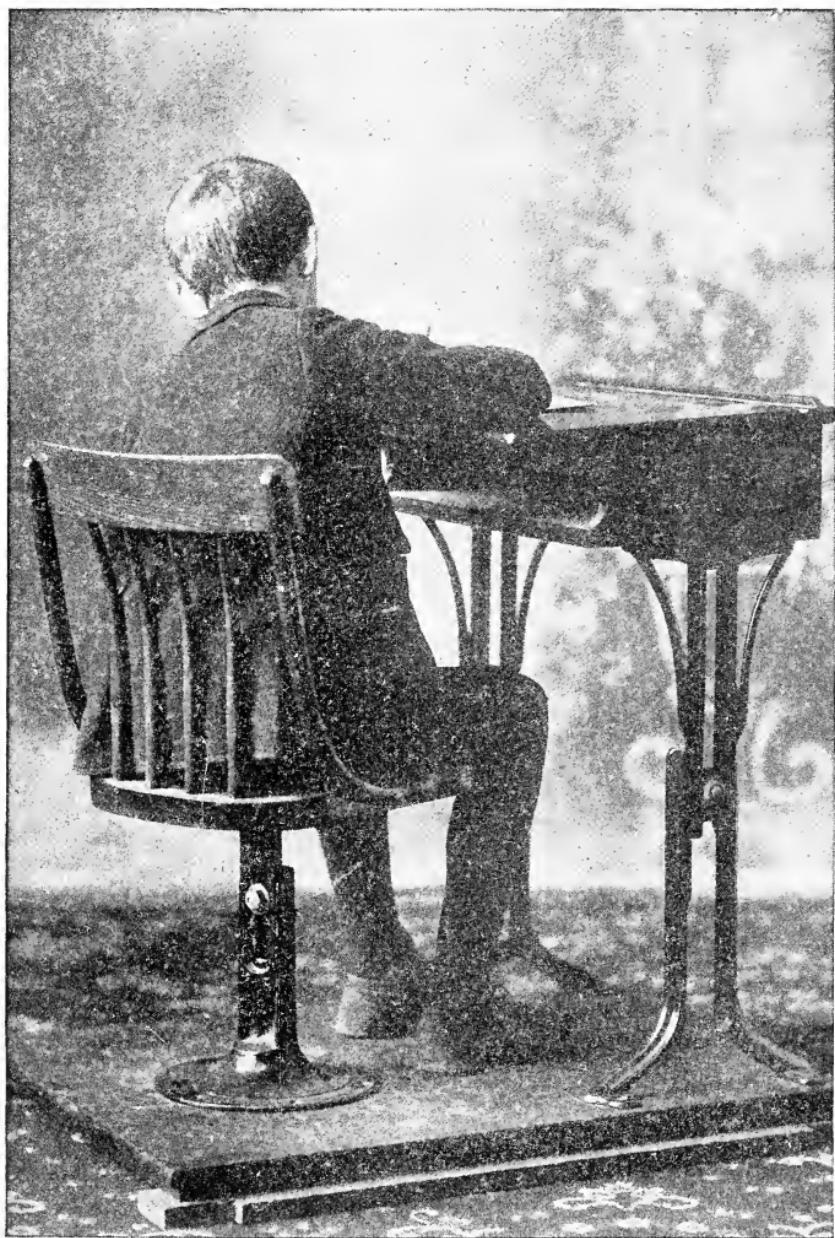


FIG. 3.

Illustrates a desk too high for the child, causing elevation of the right shoulder in writing and a corresponding curve in the spinal column.

even, graceful steps with feet well lifted from the ground at each step.

Both standing and walking can be improved at will; but in seating the children a more difficult problem is encountered. Certainly every one must regard the old-fashioned bench, or box form, as a hopeless anachronism; yet doubtless very many children to-day suffer from the effects of badly made school furniture—as unsuitable, in fact, as that which Charles Lamb describes:

“Oh! how I remember our legs wedged into those uncomfortable sloping desks, where we sat elbowing each other, and the injunctions to attain a free hand, unattainable in that position.”

The seat and desk for each pupil should be most carefully looked after; for medical works are filled with words of warning against the use of ill-fitting school furniture. Many eminent physicians, especially in Europe, have given a great deal of study to this very evil, and, as a result, have devised various desks and seats to remedy the defect. According to Dr. Farner’s theory, a pupil while sitting at a desk improperly constructed involuntarily assumes an injurious position. Often the injury is caused, during writing and reading exercises, by the pupil’s turning his head to the front or left while writing, and downwards while reading. The bad results that



FIG. 4.

Illustrates too great space between the seat and desk, causing pupil to stoop too much, inducing round shoulders.

may follow from putting children into seats too high and large for some, too small and low for others, are near-sightedness,* round shoulders, curvature of the spine, difficulty of respiration, distortion of the upper part of the body, pains and tingling sensations in the feet.

The danger from bad positions lies in the fact that they remove the centre of gravity of the body or of the head from its natural point of support. It is essential that the centre of gravity of the body be supported by the seat just as it is supported by one's feet while standing. This is impossible, however, if cramped or stooping positions are taken, as that throws the centre of gravity forward to the right or left, as the case may be. When a person sits erect, this centre of gravity is directly over the spinal column, and the head itself is supported and balanced by the muscles of the neck. But all this is changed by any forward movement, for then the centre of gravity of the head moves forward out of its natural position, and the head must therefore be supported and balanced by the help of a strong tension of the muscles of the back of the neck. When the muscles which support the head become tired, the head droops at once into an unnatural position and the shoulders become stooped.

* The normal reading distance, measured from the pupil's eye to the book, should be fourteen inches; children who show any considerable variation from the normal should be looked upon as near-sighted or far-sighted.



FIG. 5.

Illustrates a very common fault in school furniture, a too high seat. The child is unable to rest the limbs on the floor and leans over on the desk for support.

The more common defects of school furniture, as enumerated by Dr. D. F. Lincoln, of Boston, are:

"First, the desk may be too high for the child's sitting height, causing an excessive elevation of the shoulder of the hand which the child will write with, usually the right. In attempting to get the elbow on the high desk, the shoulder is elevated, the corresponding one lowered, and the spinal column tilted.

"Second, the desk may be too low, causing the child to stoop forward. This causes the neck to flex upon the body, producing interference of circulation from the head, congestion resulting, which interferes with the eyes. This same fault causes round shoulders from the continued stooping to be sufficiently near the work.

"Third, desk too far from seat, with stoop of the body, injuring the eyes. Danger here is in injuring the health by compression of the abdomen and chest, dyspepsia, small chests and round shoulders.

NOTE. Most authorities concede that better positions in the seat are maintained by the child in writing with the vertical method than with the old slant method. It is advisable that the desk lid should be movable as a shorter distance is needed in writing than in reading.

NOTE. In speaking of school furniture we call the vertical space between the rear edge of the pupil's desk and the plane of the seat the "difference." It can be ascertained by measuring the distance from the seat bones to the elbow when the arm hangs down "Distance" is the special term for the horizontal space between the rear edge of the desk and front edge of the seat.



FIG. 6.

Illustrates a too small "distance" between the seat and desk, causing pressure on chest and stomach.

"Fourth, flat desk lid, interfering with freedom of writing, disadvantageous as respects receiving the light and compelling the child to hold up his book in order to see.

"Fifth, seats too high, so that the feet are not supported and the legs grow weary.

"Sixth, insufficient support for the back, causing fatigue and improper attitudes and consequent tendency for the spine to yield and take a side curve.

"Seventh, seat not hollowed suitably, causing pain and restlessness.

"Eighth, a well-proportioned desk and seat, but not adapted to size of the child using it."

In a proper seat the child should be able to sit back firmly and have both heel and sole touch the floor fairly, with the upper and lower leg forming a perfect right angle. Foot-rests are particularly tiresome, as they limit too narrowly the motion of the child's feet. The back-rest should follow in shape the normal curves of the spine and should not reach higher than the lower border of the shoulder blades, for otherwise the free movements of the arms and shoulders are interfered with.

School furniture of the stationary kind requires the use of different sizes of seats and desks to fit the needs of the pupils; furniture, on the other hand, so devised that the



FIG. 7.

Illustrates a desk and chair too small for pupil's size, causing cramping of the lower limbs.

seat and desk can be adjusted to proper size by raising and lowering, is now in very general use, and no other kind considered. Physicians, oculists, and educators everywhere are united in advocating the use of adjustable school desks, and surely some importance should be attached to their advice, for their daily experience brings additional proof of the serious damage resulting from fitting the child to the seat rather than fitting the seat to the child. Dr. Charles L. Scudder, of Boston, an earnest student of school furniture, has made extensive examinations in the schoolroom, disclosing the following facts:

"Examination made of thirty-seven schoolrooms in Boston showed that only one-third were provided with two sizes of desks and seats. In every instance where these two sizes were found, there were only a few of the second size, and the difference in these from the others was scarcely noticeable. It was found that the rule in grammar schools was that the seats were of the same size throughout the room and that these were placed at desks of uniform height. In the matter of age there were differences in schoolrooms of from five to nine years. Children with seven years difference in age and with fifty-seven centimeters difference in height were found seated at the same size desks in seats of equal height, but

the results of such a condition are faulty and dangerous positions assumed in sitting and later in standing, and these positions unavoidably lead to serious deviations of the spine and to an unnatural elevation of the shoulders. These produce, with growing children, serious deformities. They are caused by desks which are too high or too low for the pupil's lower leg, by seats too long or too short for the thigh, by distance from the desk to the seat either too short or too long. It was clearly brought out in this investigation that the method of seating in school-houses was defective in the extreme, leading to permanent deformity in the spine and distorted eyesight. In this respect, Boston is far behind other cities, such as Worcester, Springfield and Lowell. In these places it has been recognized that the only remedy for the evil lies in providing adjustable desks, so that the pupil may be permanently fitted with the desk he occupies, and nothing but adjustable desks are purchased. The director of physical training in the public schools at Woonsocket, R. I., in 1901, after examining about four thousand pupils, reported that over two hundred children could not touch their feet to the floor in any seat in their respective rooms, and that twenty-six children were too large for the seats given them. In six rooms, over fifty per cent. could not touch the heels to the floor, the largest num-



FIG. 8.

Illustrating ill-fitting stationary furniture.

ber of misfits in any one room being thirty-two out of forty-six. Blocks were provided in many cases, but the fact remains that much of the school furniture is too large for the children who attend school in this city."

Before the National Academy of Medicine, Dr. John Jay Moore read a paper on school furniture in which he said: "I will endeavor to explain what has been the custom in seating our schools, and then you can readily see where the difficulty exists. When we have had a new building to seat, the grade of the school and the number of pupils to be accommodated in each room is ascertained by the superintendent, and the approximate ages of the children who will attend the school of a given grade. From this the size of the seats and desks to be used are obtained, regardless of the heights of the pupils in the different rooms. In the rooms in the modern buildings there are placed fifty-six seats expected to accommodate pupils from the age of eleven to fifteen, and in different rooms ranging in height from five feet eight inches to four feet four inches, with all the intermediate sizes. These fifty-six pupils, if the seats are all occupied, are expected to be perfectly seated with but two or three different sizes of seats. We find in one seat a pupil with the chin but little above the desk; in another we find the desk so low that the pupil, when sitting in

an upright position, can not see his work, thus being compelled to assume a position which will produce a crooked back or ruin his eye-sight. Still we find another little fellow who cannot touch the floor with his feet, thus losing the support to the spine which becomes so necessary to the welfare of the child at this age.

"For the lower extremities at nine years, those of the girls are longer, at eleven shorter, and from twelve to fourteen again longer. At fifteen the lower extremities of the girl almost cease growing, while those of the boy increase by four inches between the ages of fourteen and nineteen. The methods by which the seat-makers arrive at the sizes necessary leave all the scientific points out of their calculations, and give us an arbitrary size for all pupils of a given age and grade. The bad effects that result from the disproportion of the seat to the child are bad positions assumed in sitting, and a child that is compelled or allowed to assume faulty positions while sitting will assume faulty attitudes in standing. The effect of assuming malpositions repeatedly tends to make permanent and to exaggerate these malpositions, which amount in time to permanent deformity,

"In school children we have to deal with developing spines, which are soft and capable of being molded. It has been demonstrated that as long as the weight of the

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shoulders and head falls on the spine symmetrically only a posterior bending will appear. The moment this symmetrical impression is changed there is a tendency for the bones and ligaments to become molded and to grow into deformed shapes. The fact of the pupils being improperly seated causes in many cases lateral curvature. The children in trying to get into comfortable positions throw the spine out of plumb, thus predisposing the spine to all forms of curvature.

"Time will not permit me to go into all the details of the positions which produce the stooped and round shoulders, as well as those that affect the eyesight. The important question now is, 'How can this matter be remedied?' Beyond a question, the adjustable school desk is the only way out of the difficulty."

But the mere installation of adjustable furniture in a schoolroom means nothing of itself; indeed, many cases of pupils poorly fitted with seats and desks are found where rooms are thus furnished. Every pupil must have the desk and chair adjusted to him carefully and changed twice a year to allow for growth. In consequence, many teachers object to adjustable furniture because of the trouble it causes, and also because of the unsightliness of the varied heights of desks and seats in the same schoolroom. But these are trivial objections and far outweighed by the great advantages to the child's proper

growth. At the present date school authorities who use stationary furniture are certainly blamable; but far more to blame are the authorities who install adjustable furniture and then neglect its proper adjustment to the children.

There are over one hundred and fifty different makes of school desks and seats, varying from the simple, unadorned bench and box-like desk to some exceedingly complex and cumbersome foreign contrivances. The ideal chair and desk should be adjustable and easy of manipulation. Fig. 9 represents a model chair and desk properly regulated to seat its occupant.

The distance is the space that would be found between a vertical line dropped from the rear edge of the desk to the floor (A-B), and the front edge of the seat at D, which in Fig. 9 is the space between C and D.

This distance should be a minus quantity when the pupil is reading or writing.

The difference is the vertical distance measured from the rear edge of the pupil's desk and the upper surface of the seat (Line A-C). The proper length of this difference should be equal to the space between the pupil's elbow and the seat bones taken in a sitting posture. When the pupil is too far away from the desk, he either bends forward into an unnatural position or slides too far forward on his seat and occupies an unsteady position.



FIG. 9.

Chair and desk illustrating proper seating of pupil.

The difference between the height of the seat and desk should not be such that the shoulders are painfully screwed up in writing, nor on the other hand should the pupil be obliged to lean forward to write or read. It is recommended by Robson, an English authority, that the difference should equal the length of forearm or about one-sixth the height of the pupil, in which case it will be found that the under part of the forearm will rest comfortably on the desk top. The height of the seat should correspond to the length of the pupil's leg from the sole of the foot to the knee.

The seat of the chair should be slightly hollowed out to fit the body anatomically and should not be so wide as to cause pressure against the legs when they are in the flexed position. The back support of the chair should meet the child's body just below the prominent portion of the shoulder blades.

A small proportion of pupils who are either abnormally stout or thin, makes it desirable to have in each room a few seats that may be adjusted horizontally, bringing the pupil nearer to or farther from the desk as may be desired. The desk should be raised high enough to relieve any possible pressure on the thighs and to allow the outstretched forearm to rest comfortably on its surface without any effort in bending forward. The chair and desk to insure a child's use of them for any length

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of time without growing restless, must support the body comfortably and without any sense of constriction.

Especial care should be given to crippled children who are obliged to attend school. Those suffering with hip disease, or knee disease, where the joints are diseased and immovable, should be given a seat with desk placed eight or ten inches farther away than ordinarily in order to allow a greater range of motion. If one of the lower limbs be shortened by disease, a small hassock or block should be supplied on that side upon which to rest the shortened member.

To cases of curvature of the spine, which are often met with in school life, it will be more difficult to give relief in seating. The most that can be utilized is a pad or pillow of some nature to rest the back.

Children with such afflictions should be allowed more than ordinary privileges in moving about the room and should not take part in the calisthenics, unless the exercise be especially prescribed by a physician or a physical instructor.

A number of excellent makes of adjustable furniture combine simplicity and real merit. A measuring gauge with full instructions is usually supplied and the measuring may be done by the teacher and the changing of the seats by the janitor, according to the data supplied to him. So rapidly do some pupils grow that every

teacher should know of the importance of properly fitting school furniture, and can easily see that each child is comfortably seated. Changes may be necessary with the same pupil during the school year. The following table, carefully compiled by Dr. Bowditch, of Boston, Mass., will give an idea of the pupil's growth during school life, and will readily illustrate how a desk at the beginning of a school year might be correct and yet at the close of the same year be disproportionate.

Average Height, Weight, and Growth of 13,691 Boys and of 10,904 Girls in the Schools of Boston, Mass.—(Dr. Bowditch.)

Age last Birthday	Birthday	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Total No. of Observations
Average Height of Boys..	41.57	43.75	45.74	47.76	49.69	51.68	53.33	55.11	57.21	59.88	62.30	65.00	66.16	66.66		
" " Girls..	41.29	43.35	45.52	47.58	49.37	51.34	53.42	55.88	58.16	59.94	61.10	61.59	61.92	61.95	(inches.)	
Growth of Boys.	2.18	1.99	2.02	1.93	1.99	1.65	1.78	2.10	2.67	2.42	2.70	1.16	0.50			
" " Girls..	2.06	2.17	2.06	1.79	1.97	2.08	2.46	2.28	1.78	1.16	0.49	0.33	0.03			
Weight of Boys..	41.99	45.17	49.07	53.92	59.23	65.30	70.18	76.92	84.84	94.91	107.10	121.01	127.49	132.55		
" " Girls..	39.66	43.28	47.46	52.04	57.07	62.35	68.84	78.31	88.65	98.43	106.08	112.03	115.53	115.16	(pounds.)	
Increase, Boys.	4.68	3.90	4.85	5.31	6.07	4.88	6.74	7.92	10.07	12.19	13.91	6.48	5.06			
" " Girls..	3.62	4.18	4.58	5.03	5.28	6.49	9.47	10.34	9.78	7.65	5.95	3.50	0.63			
No. of Observations for Boys.	848	1258	1419	1481	1437	1363	1293	1253	1160	908	636	359	192	84	13,691	
No. of Observations for Girls.	605	987	1199	1299	1149	1089	936	935	830	675	459	353	233	155	10,904	

CHAPTER VI

LIGHT

In planning the location of a school building, great care should be taken to see that it will be well favored by sunlight. Sites in hollows and near tall adjoining structures should be avoided. In the first place, no obstacle to the entrance of light shquld exist outside the building ; and, secondly, a plentiful supply should not be hampered by too few or too small windows. A wonderful improvement in the lighting of school buildings has been made in the last quarter century. A number of schoolhouses, particularly the older ones, were found very deficient in light, due to the small, low windows. Fig. 10 is a type showing how little attention the windows received in the construction of a school building twenty-five years ago ; and Fig. 11 is a strong contrast, giving an idea of a modern school building plentifully supplied with windows.

The best light will be had where the longer axis of the building runs east and west and the windows are on the north and south sides only ; but where a building contains

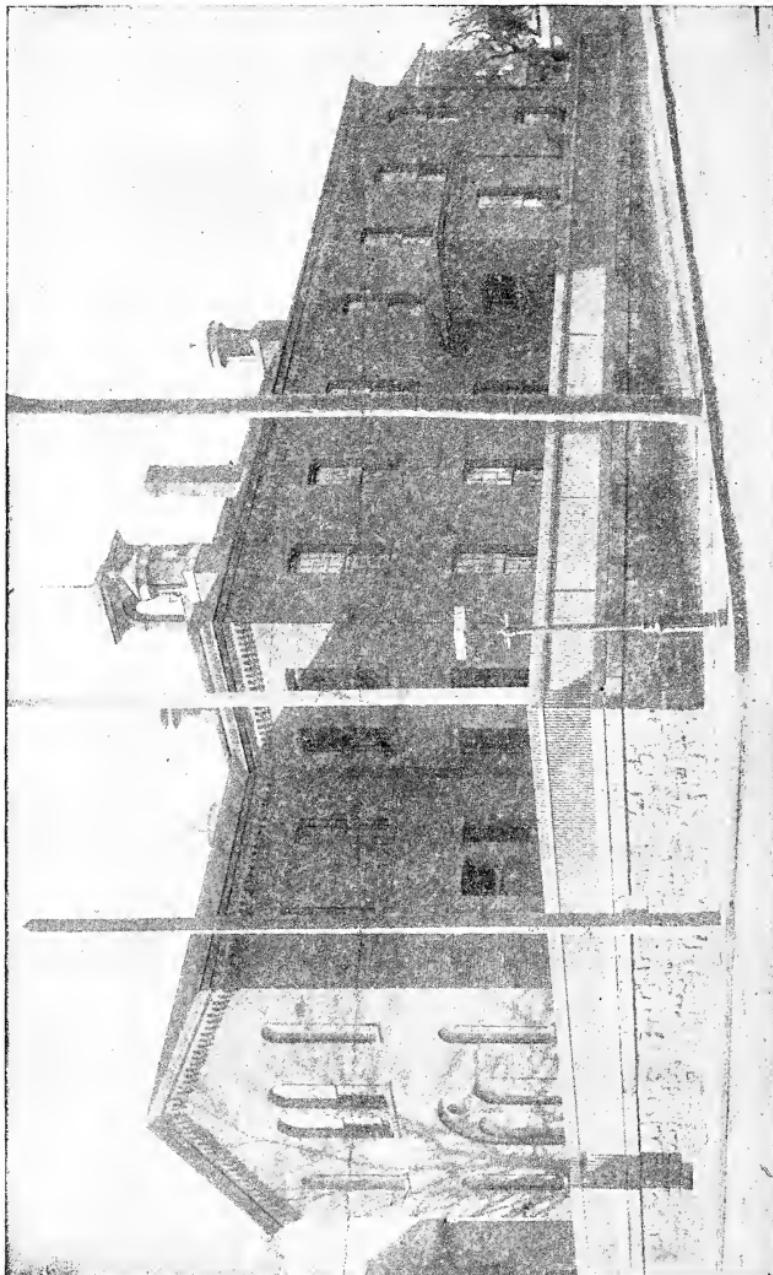


FIG. 10.

Showing attention paid to light in schoolrooms built twenty-five years ago.

four or more rooms on each floor, it will be more difficult to arrange for a fair distribution of light. In such cases, the corners of the building should face toward the cardinal points of the compass, enabling the sunlight to enter every room every day of the year. Aside from its advantages as regards light, a building so placed as to get a good sun exposure will be more easily heated and more healthful.

For the best and most equal distribution of light, the schoolroom should be long and narrow, requiring windows on but one side. The desks should be so placed that the light will not shine in the pupil's eyes, but come from the left and rear. The light from the left is best, because it falls without shadows upon the desk. As the great majority of pupils are right-handed, they would be annoyed, when writing, by the shadows that the light, coming from the right, would cast upon their work. Cross lights from both right and left are also objectionable. Light from the front is sure to dazzle the children's eyes. If the light from the rear predominates, the pupil's head casts a shadow, and there is the added objection of the teacher's inconvenience in facing light from the rear. If the light from this source, however, be indispensable, the teacher can change the location of the desk to the rear of the room, where the same oversight of the pupils is possible. Many teachers prefer their desks in this

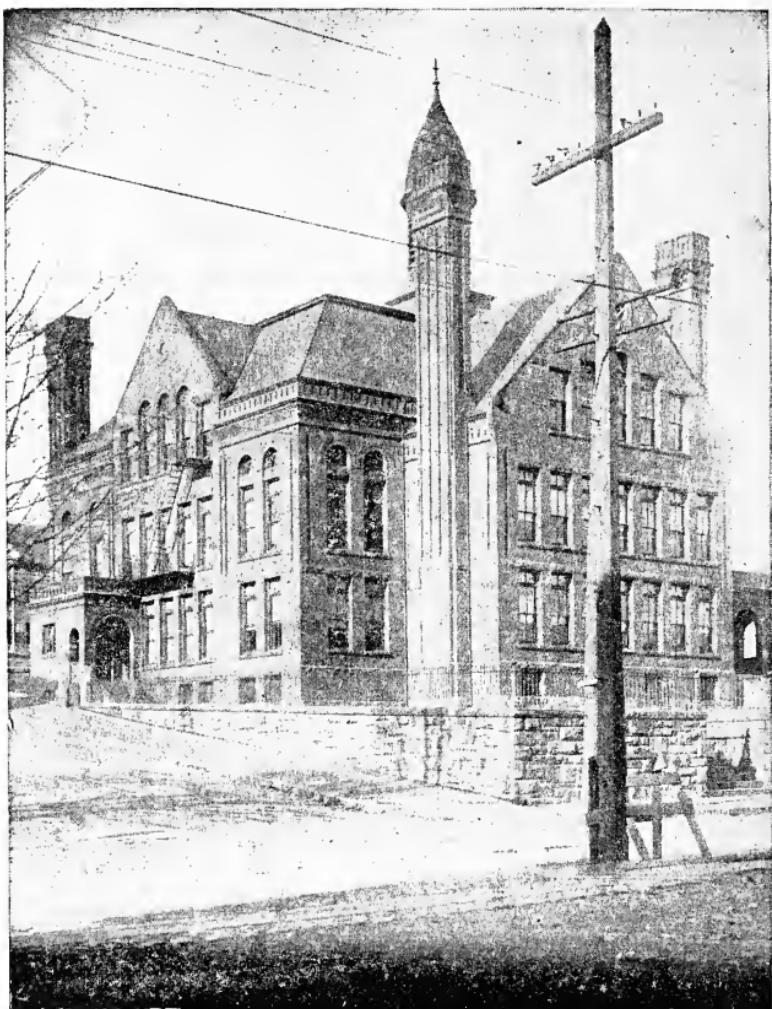


FIG. 11.

Showing modern school building plentifully supplied with windows.

position. But for teacher and pupils alike, light from the left side is desirable.

The windows should be high, reaching almost to the ceiling, and should cover an area equal to at least one-fifth of the floor space of the room. For instance, to determine whether sufficient light can be admitted: first, find the floor space by multiplying the length by the breadth of the room; then multiply the height of each window by the width, and this product by the number of windows. The latter amount should be at least one-fifth of the area of the floor.

Robson (previously quoted) contends that the window-sills should be at least five feet above the floor, and that the windows should run very high, in order that the light may descend on the pupil's work. This, however, in the case of an ordinary room of average height (twelve or thirteen feet), would entail a sacrifice of at least a foot of good lighting space, as there is little danger of the light shining upwards into the pupils' eyes if the sill of the window is three and one-half or four feet from the floor.

In every part of a well-lighted schoolroom the pupil should be able to see to read well, without an extra effort, at the normal reading distance, which is about fourteen inches. Artificial illumination should never be considered

in a schoolroom, except in evening schools, where its use is imperative. In such cases, the best light, from a hygienic point of view, is the incandescent lamp with ground glass globe. The use of the photometer, which measures the exact amount of light in a given room, will show that there are many schools to-day whose light needs to be greatly improved. This may be done by enlarging the windows both in breadth and length, and also by using reflectors and prisms, to be placed where the light enters, which greatly increase the amount.

The most evil effect of insufficient light is the defective eyesight now becoming so common in school children. It is not necessarily the continuity and closeness of application, but the bad conditions under which the eye must work that are responsible for so much eye-strain. Dr. W. A. Mowry cites a case which well proves this particular point:

"A school was built wherein special pains were taken with hygienic matters, good air and excellent light were abundant. The two hundred and fifty boys were examined upon entering, again in two years, and lastly in two years more. Almost without exception the eyesight, in spite of the constant use, was improved, showing that it is possible to obtain the right amount of light and the good effects following. The conditions bringing about

such results were as follows: Light admitted from one side and that from the left side of the pupils as they were seated. Window space equalled ten per cent. of floor space. Windows long and high. Rooms were long and not wide, no pupil being seated farther than twenty-seven feet from the source of light. No swivelled blinds, admitting light through the crevices, but a semi-opaque curtain."

Some schoolrooms have a fair amount of light on dry, clear days, and but very little on cloudy days. A teacher in such a room is justified in seeing that too close application, as in reading, is not required on dull days, but that exercises at the blackboard are substituted.

Too much light, with its blinding glare, is as harmful as too little. When the sun shines directly on the pupils and their work, it should be toned down with a sliding curtain of a light straw color. The best curtain is the one that works on a sliding device, enabling it to be adjusted to any part or space of the window.

The walls of the schoolroom should be of a light green tint, as the reflected light would then be most easy upon the eyes.

CHAPTER VII

THE HYGIENE OF THE EYE

That our power of vision is degenerating cannot be gainsaid: defective eyesight is one of the penalties we pay for education. Savage nations have especially good sight and very little trouble with the eyes. Nations that follow agriculture, or whose work is not of a very fine grade, or where the education of the young is limited, have far better eyesight than highly educated people whose work is of a more refined order. Germany is the greatest sufferer: one investigator says that sixty-nine per cent. of its inhabitants have defective vision. Children in the country, where the range of vision is greater than in the crowded cities, are not so prone to eye-troubles as city children. But though this degeneracy is a condition that accompanies advance in civilization, we should not accept it as inevitably a result of civilization. We should rather let it spur us on to do all in our power to better the conditions that affect vision. In this country, owing to the enormous increase of defective eyesight, the subject is forcing itself upon the medical profession and upon the

lality as well. It is a well-known fact that this trouble is hereditary and also congenital. The scientific researches of Dr. Ely, of New York, prove conclusively that in a large number of cases children are born far-sighted. Formerly it had been held that the only congenital defect found in the new-born was near-sightedness; but Dr. Ely had the opportunity of examining the eyes of a number of infants, and was surprised to find that a large majority came into the world with far-sighted eyes. In most cases, the trouble would naturally, in time, grow less, if only the eyes were used with great care. Instead, we have early and constant application to books in poor surroundings, and a consequent increase of the difficulty before the tenth year is reached. In Germany, Dr. Conrad, investigating among school children, found that 11 per cent. were short-sighted at nine years, 55 per cent. at eighteen, and 62 per cent. at twenty-one. Dr. Loring, an American investigator, found that school life rapidly impaired vision, but not to such a startling extent as in Germany. According to his figures, at nine years 3.5 per cent., at eighteen 20 per cent., and at twenty-one 27 per cent. suffer from short-sightedness.

The farther one progresses in the scale of education, the greater will be the liability to injury of the eyes. This point is well brought out by Dr. Cohn's table:

Schools.	Average per cent. of short-sightedness	Average amount short-sightedness.
Country.....	1.4.....	1/24
Primary.....	6.7.....	1/23
Intermediate.....	10.3.....	1/22
Polytechnic.....	19.7.....	1/20
Latin.....	26.2.....	1/19
Universities.....	59.0.....	1/12

Knowing, then, that many children have weak eyes long before they enter the schools, we should make every effort to guard the eyesight of pupils and to study the conditions and means of its improvement.

The strangest point brought out by the writer through an extensive examination of the eyes of school children, and adults as well, was that although the eyes of many were seriously affected, the persons were apparently ignorant of the fact. The onset was insidious, and little notice had been taken until the damage was irreparable. Twelve pupils were found who had practically no sight in one eye, yet who were all doing the required school work. The remaining good eye had been saddled with the work of both and was doing it as well as possible. It so happened that the trouble with the eye was in the retina and the optic nerve; and as the child did not

complain, and there was nothing in the outward appearance of the eye to draw attention to it, the trouble passed unnoticed. A number of teachers frankly admitted that they had thought many pupils, who in reality were suffering most severely from defective vision, merely stupid and inattentive.

The writer examined the eyes of one thousand school children in their respective schoolrooms. The Snellen test types were used, and each eye tested separately. The pupils were from eight to fifteen years of age, and were of all social grades. No difference was noted between the aptitude of poorer, ill-nourished children having defective vision and that of the children of the well-to-do. Very slight defects were not noted, but all marked had noticeable trouble.

The results, to say the least, were appalling. Of one thousand examined, 334, or 33.4 per cent., were defective. One in every three examined was doing work for which he was not fitted, was straining his eyes to do that which required normal eyes. No allowance was being made in any case, as, in the majority of instances, the teacher was unaware of the difficulty. The usual symptoms of eye-strain, such as headache, restless sleep, loss of appetite, twitching of the eye and lid muscles, are not always present, and nothing but periodical examinations of the

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eye will show existing defects. Often, too, many pupils, from a natural reticence, will not complain, although suffering.

The following tables show the results in detail:

ONE THOUSAND CASES EXAMINED.

Both eyes defective	146
Left eye only.....	124
Right eye only.....	52
Entire absence of sight in one eye.....	12
Number of cases of strabismus, or squint.....	28
Those defective using glasses to correct vision.....	16
Not using glasses	318
Granular lids	4
Corneal scars.....	2

VISION AND HEARING TESTS IN PUBLIC SCHOOLS.

(GULICK AND AYRES.)

PLACE.	DATE.	NUMBER EXAMINED.	DEFECTIVE VISION.	PER CENT
Bayonne, N. J.....	....	4,610	353	7.7
Camden, N. J.....	1906	10,028	2,757	27.7
Cleveland.....	1900	30,045	6,221	20.7
Cleveland, well-to-do district.....	1907	668	216	32.4
Cleveland, congested district.....	1907	616	437	71.7
Dunfermline	1907	1,526	255	17.0
Edinburgh	1904	1,330	574	43.2
Massachusetts.....	1907	402,937	99,609	22.3
Counties of Mass. except Suffolk.....	1907	....	....	19.9
Suffolk County (Boston, Chelsea, Revere, Winthrop).....	1907	....	....	30.7
Milwaukee.....	1907	1,960	293	14.9
Minneapolis.....	....	25,696	8,166	30.0
Minneapolis.....	1908	710	170	23.9
New York City.....	1906	79,065	24,534	31.3
Pawtucket, R. I.....	1901	4,663	517	11.1
Utica, N. Y.....	1897	6,113	667	10.9
Worcester, Mass.....	....	11,953	2,281	19.1

It is little less than criminal that conditions are allowed to exist resulting in such wholesale havoc with the children's eyes. Our first great duty is a realization of the situation, a survey of the probable offending causes, and an earnest attempt at their betterment.

If we could understand the beautiful and delicate mechanism of the human eye, we might take greater pains to preserve its usefulness. Nature has wisely foreseen the delicacy of the eye, the great care required for its well-being, and the necessity of guarding it better than the organ of any of the other special senses. It is set into and protected by the bony orbital cavity. In front it is protected by two curtains, the eyelids.

The eyeball, on account of its almost incompressible nature, cannot be drawn into the socket, but simply

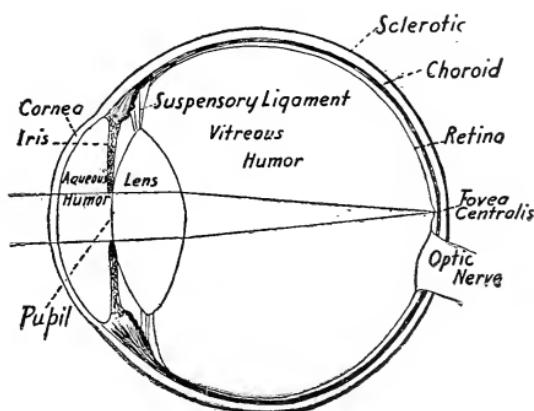


FIG. 12.

rotates there, being drawn to either side, upwards or downwards, by small muscles attached to the contiguous bony structures. When the adjustment of the muscles is perfect, a person is able to draw the eye to one side, but the corresponding muscle having an equal power, the equilibrium of the eyeball is maintained. In consequence of children's diseases, sometimes one of the small muscles becomes paralyzed. This muscle is no longer able to do its allotted work of helping to hold the eye in position, and the eyeball is pulled to the opposite side by the unaffected muscle. This condition is known as strabismus, or squint, and often follows early cases of long- or short-sightedness.

These cases, as soon as noticed by the teacher, should be brought to the parents' attention, with a request that an attempt be made to remedy the defect. Very good results are often secured by the wearing of carefully selected glasses upon an oculist's advice. Undoubtedly the parent will notice the squint as soon as the teacher, but the request of the latter to have something done will usually produce good results. Sometimes, however, it will be difficult to impress an ignorant person with need for action in such cases. One mother who was reminded of her duty in a neglected case, thought she would be "flying in the face of Providence." She was finally

convinced, nevertheless, of her error in the matter, and the case was referred to an oculist, with great benefit. With some long-standing cases, glasses will not mend matters, and an operation will be necessary. This operation is simple, however, and usually successful. Indeed oculists are compelled to operate in fewer cases of this kind each year, as they are now becoming more adept at removing the difficulty without recourse to an operation.

When an eye turns in or out or away from its fellow, the danger is that the power of sight will begin to fail in the eye and will continue to fail. Every case of squint discovered, then, should be referred to the eye specialist.

In studying the eye as shown in Fig. 12 from the front to the back, we see the cornea, the aqueous humor, the pupil, the iris, the crystalline lens, the vitreous humor, and the retina. The cornea, perfectly transparent, is the first structure through which the light passes. The aqueous humor fills the space between the back of the cornea and the lens. The iris divides this space into two chambers, the anterior and the posterior. The colorless, transparent, bi-convex, crystalline lens serves to focus the light entering the eye. The vitreous humor is a soft, jelly-like substance, clear and transparent. The retina is the innermost lining of the eyeball, and is the sensitive area upon which the images from external objects are refracted.

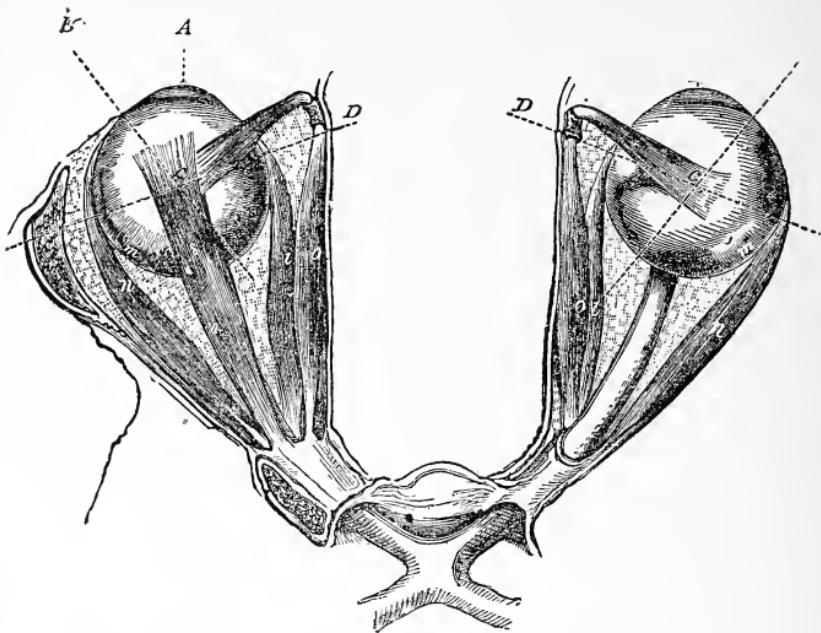


FIG. 13.

SHOWS THE MUSCLES OF THE EYEBALL IN NORMAL POSITION.

A, A. The parallel optic axes. *C, C.* The centres of motion of the globes. *B, B.* Axes of rotation of the oblique muscles. *D, D.* Axes or rotation of the superior and inferior muscles. *n, n.* External straight muscles. *i, i.* Internal straight muscles. *o, o.* Superior oblique muscles, running through pulleys at *D, D.* *s.* Superior straight muscle of one eye. This muscle is removed in the other eye to show the optic nerve. *m, m.* Attachments of the inferior oblique muscles, which cannot be seen in this view from above. The space between *D, D.* is the cavity of the nose.

If we look at a house a mile distant and then look at one of the fingers placed before the eyes, we find it can only be done* with a distinct sense of muscular effort somewhere in the eye. This effort, spoken of as accommodation, is the same act as is accomplished by the screw in

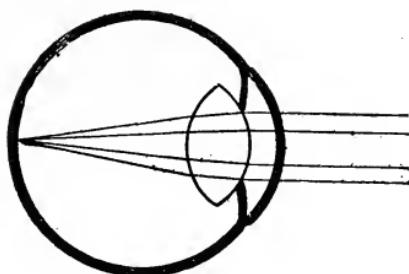


FIG. 14.

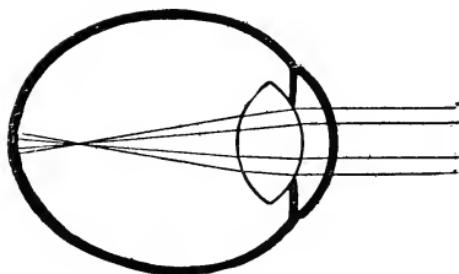


FIG. 15.

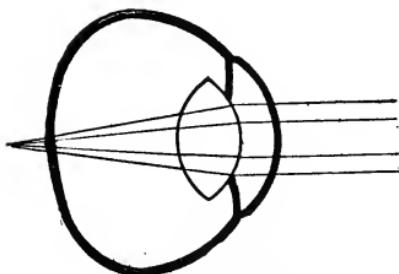


FIG. 16.

an opera-glass. It is performed by the aid of ciliary muscles and the suspensory ligament of the lens, which alter the convexity of the lens. Emmetropia is a term used to designate normal vision as illustrated by Fig. 14, when parallel rays entering the eye are focused exactly upon the retina. But in some eyes the eyeball is too long, and the parallel rays meet in front of the retina, as shown in Fig. 15. This condition is known as myopia, or short-sightedness. To enable such eyes to see distant objects it is necessary to use concave glasses. Or the eyeball may be too short; then the parallel rays come to a focus behind the retina, as in Fig. 16. This condition is called hypermetropia, or long-sightedness, and for its correction convex glasses are needed. In yet other cases, owing to the fact that the cornea or the crystalline lens is not true in shape, the rays are not focused at any single point upon the retina. This is spoken of as astigmatism, and is usually corrected by cylindrical glasses.

These are the principal defects that are found in children's eyes, and though the teacher is not expected to be able to differentiate them, she should make it her duty to report all cases to the proper authorities. In cities or towns where a medical inspector is employed in the schools, a great burden of responsibility is lifted from the teacher's shoulders. If there should be no such officer,

4 D

60

F Z I

40

O E L

30

L P O I

20

L N

T.

B D E

T.

Z T G

T.

R F D Z

T.

the teacher can easily learn to discover at least the most flagrant cases of defective vision.

The type as printed on the plate opposite can be used in examining the eyes, or for a small sum the regular Sneller test types may be purchased and hung in the room. The record should be kept as follows: R. V. is the abbreviated form of writing "right vision"; L. V. "left vision." Seat the pupil twenty feet from the test types, and, if examining the right eye, place a piece of cardboard before the left eye. If the five rows of type can be read entire, vision is normal, or R. V.= $20/20$. If, however, only the four upper rows are read, and the thirty-feet type are the smallest discernible, the vision would be $20/30$. If only the upper row can be read, the vision would be but $20/60$. Proceed in the same manner with the left eye, and use the same means of recording the degree of vision. For a reading test, the normal eye should be able to make out the following diamond type at a distance of twelve inches:

THE FACULTY of memory, which receives and retains ideas and images, and which exhibits them again with or without the exercise of volition, early became the subject of philosophical research. There are very many curious phenomena connected with this power of the mind; it is sometimes as *recreant to its trust*, when most its service may be required, as the veriest bankrupt; at other times, when in a fit of strange caprice, it will obtrude upon us in a most unseasonable and unmerciful manner, hovering upon us thoughts and things we would willingly bury in oblivion. Yet, after all, memory is indispensable to moral economy; its aid is as much required in things mean as in things immense. Without this mysterious private secretary, we could not enact our several parts on the arena of life; our boasted being would be reduced to a mere vegetable existence. Memory is said to be essential to every kind of action; timid animals are instigated to avoid capture, and to flee from the attacks of the very ferocious, more from the remembrance of the consequences of previous sufferings than from what we

In 1895, Dr. Frank Allport, of Chicago, devised a set of practical questions for instructing teachers how to examine pupils above the first grade for the detection of eye and ear defects. These are: 1. Does the pupil habitually suffer from inflamed lids or eyes? 2. Does the pupil fail to read a majority of the letters in the number XX (20) line of the Snellen test types, with either eye? 3. Do the eyes and head habitually grow weary and painful after study? 4. Does the pupil appear to be "cross-eyed"? 5. Does the pupil complain of earache in either ear? 6. Does matter (pus) or a foul odor proceed from either ear? 7. Does the pupil fail to hear an ordinary voice at twenty feet in a quiet room? Each ear should be tested by having the pupil hold his hand over first one ear and then the other. The pupil should close his eyes during the test. 8. Is the pupil frequently subject to "colds in the head" and discharge from the nose and throat? 9. Is the pupil a habitual "mouth breather"?

If an affirmative answer is found to any of these questions the pupil is given a printed card of warning to be handed to the parent. These cards are non-obligatory in their nature. They do not require anything of the parent, who is at perfect liberty to take notice of the warning card or not, as he sees fit. If the parent neglects the warning it is repeated.

With children who are not yet familiar with the alphabet the tests previously given (p. 74) are useless. For such Dr. Cohn suggests the use of a line of capital E's, the child to determine, at a distance of twenty feet, the direction in which the arms of the letter point, whether upwards, downwards, to right, or to left.



FIG. 18.

To examine for astigmatism is far more difficult than to examine for hypermetropia or myopia. For such an examination the horizontal and vertical lines of Fig. 19 may be used. Test one eye at a time, at a distance of twenty feet. If astigmatism is present, some of the lines will be blurred and run together, while the others will be clear and well-defined.

A peculiar anomaly in some persons—most commonly men—is a failure to distinguish colors. This defect, known as color-blindness, is theoretically explained as being caused by the absence of one or more of the color sensations. To detect it, a heap of worsted yarn of all tints is taken, and a thread of a particular color, for instance a red, is selected. The subject is then required to



FIG. 19.

TEST FOR EXAMINING THE EYES FOR ASTIGMATISM.

pick out from the heap all of the other threads of the same color; if red-blind, he will choose not only the reds but the greens. It is often a matter of consequence to discover this peculiarity, especially in railroad men and

sailors, since the colors most often mistaken are red and green, the important colors in railroad and marine signals. The teacher should constantly watch the pupils for inflamed eyes, inflamed eyelids, styes and squints. She should pay particular attention to those that hold the reading book less than twelve inches from the eyes, or at arm's length, to those that tilt their heads when reading, those that cannot read blackboard writing from their seats, those that complain habitually of headache and those that fear the light. The parent should be notified of the condition of the child's eyes and encouraged to have the proper glasses made and worn. Children with defective vision should be looked upon as physically below the standard and should not be expected to do full work.

It should be the duty of school authorities to study well every condition that would better the pupil's vision. The greatest essential is good light: schools with poor light show a high percentage of defectiveness, one case, where the light was miserable, running as high as fifty-nine per cent. The use of slate and pencil is far more harmful to the eyes than paper and pencil. The paper on which the books are printed should be heavy and without gloss.

The type used, according to Dr. Cohn of Breslau, who is an authority on the optical requirements of good printing,

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should not be less than 1.50 mm. in height and the small “n” not less than 1.30 mm. wide.

For the beginners in reading, the type should be 5 mm. in height, and gradually reduced to 2 mm. in height by the time the fifth year of school work is completed. The distance between letters of the same word should measure .75 mm. and between the separate words 2 mm., with 2.5 mm. to 3 mm. between the lines.

The eye is much more easily fatigued in reading long lines than short ones, and it is recommended that the length of lines of the school book approximate 80 to 90 mm. and be not longer than 100 mm.

It is essential that the type employed in books used in the first grade be large and distinct, for now for the first time the vision of the child is to be confined to a limited space.

We must use two hands to do most of these things.

FIG. 20.

The second year, the eye having become habituated to the books, the type need not be so large.

It does not hurt the eyes to use them.

Indeed, they learn to see better by being used, if only they are well treated.

FIG. 21.

But in no books supplied for the schools should the type be less in size than "Small Pica," which is the type employed in this book.

These matters, however, may be all changed to the desirable point, and yet many eyes continue to suffer. There is a radical fault in the school system, and that is in the school programme: It should be changed so that the periods of eye-work would be shortened and greater time left between. It is a difficult problem to solve, considering the ambition of the child, of the parent, and of the school authority, but the time must come for a wide departure from the present mode of work. The course of study should be less compulsory—rather elective to suit each individual case, and the amount of work expected from each child should be a matter for the physician to determine after a careful consideration of motor and mental ability.

Care should be taken about the "extras" imposed upon a child, such as private lessons in music, drawing, and fancy needlework, as often such work is especially fatiguing to the child's eyes. The home study should be entirely omitted where the pupil has weak eyes.

CHAPTER VIII

THE HYGIENE OF THE EAR

Next in importance to the eye in the consideration and care that it requires is the ear. The percentage of aural defectiveness in school children ranges with different observers from six to twenty per cent. Careful examination of the hearing of a large number of school children in Chicago showed that 16 per cent. had perceptible defect in one ear, and that 7 per cent. had defects in both ears. Children of the age of seven or eight years were more prone to show such defects than those of any other age. School conditions, however, will not benefit or harm the ear in as great a degree as the eye.

The causes of deafness will be clearer with an understanding of the anatomy of the ear. It consists of three portions: the external, the middle, and the internal. The external ear comprises, in addition to the part seen on the exterior of the head, the passage that leads inward as far as the drum-head. The middle portion, or tympanum, is a cavity lying beyond the drumhead. From this part a small tube leads to the upper portion of the throat, or,

more properly speaking, the pharynx; this is called the Eustachian tube. Its object is to equalize the pressure of air on each side of the drum, allowing it to move with the slightest air vibration. In the tympanum lie three small bones, forming a connection between the drum-head and the internal ear. The internal ear consists of chambers and tubes hollowed out of the temporal bone.

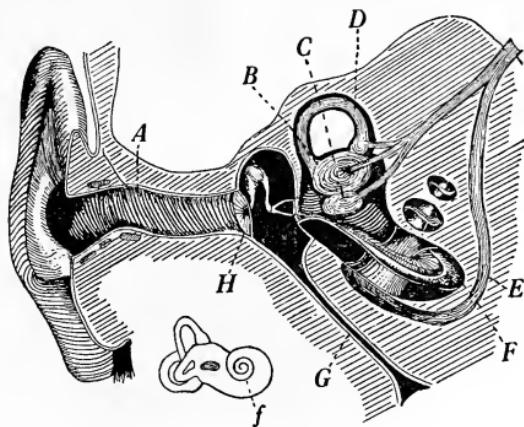


FIG. 22.

VIEW OF THE HUMAN EAR.

A, external auditory meatus; *B*, utricle; *C*, saccule; *D*, semi-circular canal; *E*, nerve; *F*, cochlea; *G*, Eustachian tube; *H*, tympanic membrane; *f*, cochlea.

In 1907, of 402,937 children examined in Massachusetts for defective hearing, 27,387 or 6.3 per cent. were found to be suffering from some degree of deafness. In New York in 1906, of 79,065 examined, 1,633 showed defective hearing.

Some points should always be borne in mind. Blows on the ear are extremely likely, by forcible compression of the air in the auditory canal, to rupture the drumhead. Even where corporal punishment is tolerated, this should not be the method employed. Pulling the ear will sometimes cause it to ache. At any rate, if a child be slapped upon the ear, or be pulled by the ear by a teacher, the parent will use that as an attributable cause for any disturbance that may at any later time arise. Foreign bodies in the ear, such as peas, beans, and small pebbles, should be let severely alone, as any probing will usually push the substance farther into the canal. They can safely be removed only by washing out with an ear syringe. There is excellent sense in the old adage, "Never put anything into your ear smaller than your elbow," which is a facetious way of advising putting nothing at all into the ear. Teachers should warn pupils against the very dangerous practice of introducing pen-holders, pencils and pens into their ears.

A recent invention called the audiometer has been considerably used in testing hearing and is valuable from its simplicity of operation and the exactness of its working. It employs an electric current which can be varied at will through a fixed scale of intensities, the operation producing a series of clicks in a telephone receiver held to the

ear. When this instrument is not available, the most satisfactory way of determining the extent of a child's hearing is by the "whispered number" test: a normal ear should hear the whispered voice at twenty feet. Seat the pupil twenty feet away, with one ear towards the person making the test, and the other ear blocked by the hand. Be careful to note that the child is not looking at the examiner, as it would be difficult to tell how much was understood by the ears, and how much by sight-reading of the lips. Whisper any number at random and ask the child to repeat, giving at least ten numbers. If the child is unable to hear, or wrong answers are given, advance slowly toward the pupil, repeating the number in the same manner. Make careful record of the hearing, marking it normal if the whisper is heard at twenty feet, one-half if heard at only ten feet, one-quarter if at five feet, etc. The test should of choice be conducted quietly and away from the remainder of the pupils. Sometimes the ticking of a watch is used in place of the voice; but the number test is preferable, since many pupils, from a desire to be considered "smart," will profess to continue to hear the watch long after they are unable to do so. The ticking of an ordinary watch should be heard by the normal ear, in a quiet room, at a distance of twenty feet.

The school, as has been remarked, is hardly as account-

able for bad hearing as for bad eyesight. Many of the ear troubles follow infectious diseases; some result from colds, enlarged tonsils, chronic catarrh, and adenoid vegetations; while others are mechanical in their nature and are the result of some foreign body in the external ear passages, most often a plug of hardened wax. When from the latter source, the trouble can easily be remedied by a surgeon. Bad hearing from catarrh is an exceedingly difficult matter to treat, but the only time that any prospect of improvement can be held out is during the school age, for usually after this stage the case becomes incurable.

Deafness due to enlarged tonsils and adenoid growths in the naso-pharynx is greatly improved when an operation is performed. When due to the above causes, a defect in speech is usual and the child breathes with the mouth half-opened. This condition is known as mouth-breathing. The child presents a distracted, expressionless appearance, is unable to talk well, to hear well, or to study well; unable to talk well, because the enlarged growths in the throat act as foreign bodies; unable to hear well, because these same growths block up the Eustachian tube, spoken of as running from the throat to the ear; and unable to study, because the nose and the throat are partly occluded, denying a sufficient amount of air to the lungs,

and causing the same sleepy, tired feeling that poor ventilation produces. Adenoids are believed to be very favorable soil for the growth of the tubercle bacillus and are often starting points of diphtheria and scarlet fever.

In 1907, in New York city, of 7,608 pupils examined, 2,159 suffered from enlarged tonsils and 1,248 with adenoid growths.

A child with enlarged tonsils or adenoid growths speaks always as one does with a severe cold in the head. He says "cobbod" for "common," and "sig" for "sing."

The photographs Nos. 23 and 24 show a child with the typical face of a mouth-breather from adenoids and the change in the entire facial appearance when the offending growths have been removed.

It would be valuable for every teacher to have a register kept containing data of each pupil's eye and ear capacity. With this knowledge at hand, many who are considered stupid would be shown to be only unfortunate, inasmuch as the avenues to their brain are partly blockaded; they need additional aid instead of censure. Those whose hearing is defective should be given seats within easy range of the teacher's voice, and should at all times be subjects for special consideration and regard.



FIG. 23.



FIG 24.

CHAPTER IX

THE VOCAL ORGANS

The voice is the sound resulting from the passing in and out of the air over the vocal cords, two folds of membrane in the larynx, or upper part of the air passage between the windpipe (trachea) and the base of the tongue. When the cords are relaxed, the air passes between them without sound; but at will the small muscles guiding the cords can be set tighter, so that as the air passes they vibrate and produce sound. The difference in pitch is created by the degree of tension of these cords; when they are loosely set, a low note results; when tighter, a high one. With the assistance of the upper part of the throat (the pharynx), the cavity of the mouth, the tongue and the lips, these sounds are modified into spoken words.

A good voice and the ability to speak clearly and distinctly are of such incomparable value in after life that especial effort should be made by teachers in training the voice. With the advent of the Kindergarten, where the child comes earlier than formerly under school training,

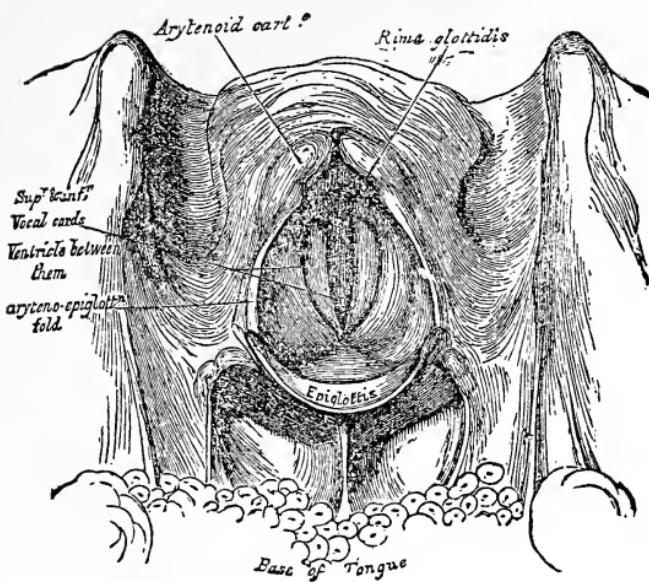


FIG. 25.

THE LARYNX AND ADJACENT PARTS, SEEN FROM ABOVE.

and with the knowledge that the teacher should possess of the great improvement persistent effort and patience will bring about in the speech of children, the coming generation should show decidedly less defectiveness of this kind.

The child is able to talk fairly well by the time he reaches the school, having begun usually at from twelve to twenty months. Any child at two years of age who is not able to talk should be a subject for the physician to consider.

The principal vocal defects noted are stuttering, stammering, lisping, drawling, hurried speech, thick and indistinct speech. Many of these affections are inherited, and usually manifest themselves when the child is from three to seven years of age. Careful observers have noted that errors of speech are intensified at about the ages of second dentition (six to eight years) and of puberty (about fourteen years).

Stuttering and stammering are commonly, but improperly, used as synonymous. Stuttering is defined by Dr. H. Gutzman as a spasmodic nervous disorder which obstructs the uttering of syllables by spastic contractions at the stop points for vowels and consonants in the articulating tube. The impeded utterance is accompanied by a spasm, usually of the muscles of the face and neck, but sometimes involving the muscles of the trunk and limbs, and is always further accompanied by great nervous embarrassment. The difficulty is encountered principally with the explosive consonants b, p, t, g (hard) and k; less often with the other sounds. The impediment may be complete (as "bb—oy" for "boy"), or incomplete ("b-b-b—oy").

A stammerer finds difficulty in articulating at all, and succeeds only after repeated attempts, while the stutterer is able to make sounds, but has trouble with syllabic com-

binations. Either trouble may be of central origin—that is, resulting from some disturbance of the speech center in the brain—or of peripheral origin consequent upon some defect of the respiratory passages.

Dr. Hartwell, in examining one hundred and thirty thousand school children in Boston, found that one thousand of this number were stutterers, and that the proportion of boys to girls suffering was as three to one.

Professor A. Melville Bell, who long studied this question, wrote as follows: "No part of education is, in general, so lightly esteemed as that of first learning to speak and read; yet, rightly considered, there is none of more importance. The first governess, tutor, or schoolmaster should be a model of distinctness in his own practice, and should be also intimately acquainted with the physiology of articulation, that he may, both by wise precept and potent example, mold the plastic mouth to grace and give easy play to the delicate machinery of speech. With proper initiatory training and school surveillance, stammering and its train of silent errors would be altogether unknown."

Enlarged tonsils, adenoid vegetations, harelip, cleft palate and short tongue-strings are all exciting causes of impeded utterance. Hysteria and imitation are probably causes in some cases, and nervousness is certainly a great

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excitant in all cases. One pupil, it was noticed, could read very well when his back was turned on teacher and pupils. Dr. Pershing, of Denver, declares that when alone or in darkness the stuttering or stammering habit disappears entirely, and it is a matter of common observation that undue excitement or embarrassment intensifies the defect.

The treatment of such cases must first be referred to the physician, to see if the cause be a removable one. Experience shows brilliant results from surgical treatment where the cause is peripheral; less satisfactory results are observed when the trouble is of central origin. Given a pupil with a speech defect, he should become at once a subject for special consideration from the teacher, and never should his misfortune be paraded before his fellow pupils for ridicule. He should not be called upon for special exercises, such as declaiming, until he has had sufficient training to give him mastery over his voice. Let him follow this primary rule: in speaking, whenever the impediment is encountered, stop immediately, compose one's self, begin again, and stop each time trouble is encountered.

A great deal of training should be given privately, and the child encouraged to think that persistent efforts on his part, when alone, in speaking aloud, will greatly benefit

him. He should be told of the illustrious example of Demosthenes, whose first public speech made him the butt of ridicule, on account of his imperfect utterance, and who, after months of patient effort, in speaking only to the waves on the seashore, mastered the situation and became one of the greatest orators the world has ever known.

Sir Morrell Mackenzie, the greatest of authorities on the human voice, emphasizes the point of early training : "If there is any doubt as to when it is best to begin the training of the singing voice, there can be none as to commencing the education of the speaking voice. It can hardly be begun too soon ; in this way faults of production and articulation can be prevented, or, as it were, 'strangled in the cradle,' which in after life can only be got rid of with infinite trouble and vexation of spirit. Too much stress cannot be laid on the importance of surrounding a child, even before it can speak, with persons whose accents and utterance are pure and refined. The Greeks, at their period of highest culture, were keenly alive to the necessity of this, and would allow no servants near their children, but such as spoke correctly."

This strong advice is in strange contrast with the pernicious habit many parents have of speaking to their children in a foolish lingo of "baby talk."

Various other faults of speech will entirely yield to proper care. Some children have a rapid, jerky way of speaking that mumbles many of the words together; some lisp and drawl; others have a thick, indistinct tone. All departures of this nature should concern the teacher and receive her earnest attention. She should correct the child over and over again until the proper sounds are produced. There is no system or method which will benefit those troubled with defective speech so much as intelligent and persistent efforts on the part of the teacher and parent in clear enunciation. The child will ordinarily be shy and sensitive to the ridicule that his speech brings upon him, and speak in a low, muttering tone. He should receive sympathy and encouragement always, and be instructed to produce loud, clear sounds, bringing strongly into play the abdominal muscles and diaphragm. Owing to individual peculiarities, some children seem incapable of pronouncing such sounds as "r," making it "w," but practice will help greatly.

On the other hand, many speech defects result from congenital defects in the lips, the tongue, the soft and the hard palate. Hare-lip is a congenital fissure of the lips and may extend back through the bony parts of the mouth, causing cleft palate. It is a common deformity and interferes greatly with proper speech. Such cases should be operated on in infancy, long before the patient

reaches school age; but even in school, it should be remembered, it is not too late to operate successfully. Tongue-tie is an affection where the tongue is bound down and cannot be protruded beyond the teeth. It is a serious drawback to proper articulation, but is easily and simply remedied by dividing the tongue-string. Cleft palate is an unnatural, congenital opening in the roof of the mouth and may involve the soft palate or extend into the hard palate. The severe forms occasion serious disturbances. In swallowing, the liquids pass through this false opening and out through the nose. As the child learns to speak, his articulation is faulty and his voice very nasal. Early operation is advisable, before school age and preferable before the child has learned to talk. When the operation is undertaken late, even if it is successful, the child will have great difficulty in overcoming the faulty habits in speaking already acquired. Defective and irregular teeth also are an impediment to proper enunciation. The teeth of school children often receive scanty care, and, as a rule, are in poor condition. Pendley, of England, examined the teeth of 3,800 school children, and found that 75 per cent. of that number were badly affected. The real province of the school authorities in such matters is not great, but much good will come from the teacher's suggestions to care for the teeth with frequent cleansings with the brush.

CHAPTER X

RELATION OF CONTAGIOUS DISEASES TO THE SCHOOL

Ordinarily the terms "contagious" and "infectious" are used synonymously as referring to diseases communicable from one person to another. There is, however, a distinction. Contagious diseases are usually transmitted by direct contact, while infectious diseases are those borne by water, air or food. The distinction is a fine one, and for ordinary purposes the term "contagious" may be used to cover all diseases that are popularly spoken of as "catching."

The rules and principles intended for the public schools in relation to contagious diseases are just as applicable to private, parochial and Sunday schools. The Attorney General of the State of New York in 1903 rendered an opinion to the effect that though the State Health law does not compel parochial school authorities to exclude unvaccinated children from attending school, yet the local board of health may direct general vaccination, and provide a penalty for non-compliance. The opinion, the first one passed upon

this question, was given as a result of the situation at Dunkirk, N. Y.

The principal diseases to be considered are measles, smallpox, mumps, diphtheria, scarlet fever, whooping-cough, typhoid fever, chicken-pox, erysipelas, influenza, tuberculosis, typhus fever, and contagious eye and skin diseases. The diseases enumerated vary greatly in their contagiousness, some being especially violent in their ravages, while others are far more inert.

Dr. Louis C. Parkes has arranged a very comprehensive table of communicable diseases:

CLASS A. Contagion, usually air borne.	Smallpox. Scarlet fever. Measles. German measles. Mumps. Chicken Pox.	Whooping Cough. Influenza. Typhus. Erysipelas. Epidemic pneumonia.
CLASS B. Contagion, usually air or water borne.	Yellow fever.* Cholera. Enteric fever. Dysentery. Diarrhoea.	Diphtheria.

* Discoveries in 1902, by means of the experiments of Reed, Carroll, Agramonte, Guiteras, and others, proved beyond a reasonable doubt that yellow fever is inoculated by the sting of mosquitoes.



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CLASS C.	Foot and mouth disease. Leprosy. Ophthalmia. Glanders. Rabies. Vaccinia. Tetanus.
Contagion, usually by inoculation.	
CLASS D.	
Surface lesion necessary for contagion air borne or directly by inoculation.	Erysipelas. Septicæmia. Pyæmia.
CLASS E.	
Contagion, air borne or by inoculation.	Tuberculosis. { Scrofula. Cerebro-spinal meningitis. Lupus.

When a disease presents itself in a community only in a few and widely scattered cases, it is spoken of as being "sporadic." When a number of cases of a contagious disease are found in a community, it is said to be "epidemic." A disease would be "epidemic" when found in a community in the following proportions:

For a population of	100.....	5	per hundred.
" "	500.....	4	"
" "	2,000 to 5,000.....	22½	per thousand.
" "	6,000 to 10,000.....	16	"
" "	20,000 to 50,000.....	8	per ten thousand.
" "	50,000 to 100,000.....	4	"
" "	200,000 and over.....	1	"

Most of the contagious diseases are caused by germs entering the system, multiplying and thriving and by their presence causing the particular ailment. The space of time elapsing between the entrance of the infection and the manifestation of the disease is known as the "period of incubation." It varies as follows:

DISEASE.	PERIOD OF INCUBATION.	APPEARANCE OF ERUPTIONS.	PERIOD OF INFECTION.
Smallpox.	11 to 14, usually 12 days.	Second or third day on face or forehead.	Three to seven weeks.
Chicken-pox.	7 to 14, usually 12 days.	First to fourth day of fever, on trunk and shoulders.	Four weeks; until every scab has fallen.
Measles.	10 to 14, usually 10 days,	Fourth day of fever, on forehead.	During initial symptoms and until end of desquamation.
German measles.	7 to 15, usually 14 days.	First to fourth day fever, on face.	Same as measles.
Scarlet fever.	1 to 7, usually 3 to 4 days.	Second day of fever, on trunk.	End of desquamation and complete disappearance of throat symptoms.
Diphtheria.	2 to 10, usually 2 to 3 days.	No eruption; rash sometimes on second or third day of fever.	Until all discharges have ceased and throat symptoms have disappeared.

DISEASE.	PERIOD OF INCUBATION.	APPEARANCE OF ERUPTIONS.	PERIOD OF INFECTION.
Whooping cough.	4 to 14, usually 7 days.	No eruption.	During catarrhal stage and as long as whoop lasts.
Typhoid fever.	1 to 26, usually 12 days.	Sometimes spots on abdomen between sixth and fourteenth days.	Until diarrhoea ceases.
Yellow fever.	1 to 7, usually 3 to 4 days.	Jaundice sometimes on second day of fever.	Until fever ceases.
Mumps.	14 to 21 days.	No eruption.	Until swelling has disappeared.

Dr. Meredith Young, of Crewe, England, divides the contagious diseases into two classes, A and B.

Those in Class A are: Scarlatina, diphtheria, measles, rubella, mumps, pertussis, varicella, variola and influenza. In Class B are mentioned erysipelas, ringworm, diseases of scalp, scabies and purulent conjunctivitis.

When diseases of Class A occur, all children living in the same house are excluded from school; as for Class B, the exclusion of the patient alone is demanded.

The objection to such a classification would be found in the difficulty of carrying out as stringent exclusion from school with influenza as with scarlatina.

Usually the child that has received the infection remains at school while the disease is breeding.

Certain of the diseases enumerated have a characteristic eruption, viz.: smallpox, chicken-pox, scarlet fever, and measles. These are known as the eruptive fevers. The time elapsing from the first symptoms of illness to the breaking of the eruption, or "rash," is spoken of as the period of "invasion." With smallpox it is from two to three days; with measles, four days; with scarlet fever, two days; with chicken-pox, one or two days.

Thanks to the great discovery of vaccination by Edward Jenner in 1798, smallpox has not now the important place in the list of school diseases it once had. Living in this generation, almost freed from this horrible plague, we can hardly picture the devastation this disease formerly caused. Macaulay, the English historian, called smallpox "the most terrible of all the ministers of death." Professor Wernher, in his work "*Zur Impffrage*," says: "Before the introduction of vaccination, smallpox had become a permanent disease which never entirely ceased in any one year, and every three or five years became a great epidemic. In non-epidemic years, one-tenth of all mortality was from variola; in epidemic years, one-half. Very few men escaped smallpox till old age; almost every one sickened at least once in his life of this horrible, murderous disease. Countless mortals were maimed by loss of sight. Of new-born children, one-third died

of smallpox before their first year; one-half before their fifth year of life. There was no family which had not had heavy losses to deplore. Men accepted the pest as an unavoidable fate. It was the principal factor which deterred or kept back the population from progress; yet the efforts of many ignorant mortals are directed toward a return to these conditions." Looking at present conditions, the same author says: "We now find no child mortality among vaccinated children; among adults also, whenever vaccination and revaccination are maintained, mortality from smallpox is at an end." That vaccination does prevent it is shown by Prussian statistics of the approximate average annual rate of deaths from smallpox per million before the practice of vaccination and after. Before the introduction of vaccination the rate was 3,321; after, only 56.

An inspector of contagious diseases in New York said: "During our nine years of service in the Health Department of New York, I have never seen a case of smallpox in a person who had been vaccinated successfully within five years, and the number of cases I have seen mount into hundreds. During that period, I have seen only one inspector contract smallpox, and he was the only inspector who disbelieved in vaccination and refused to have it performed upon himself."

Drs. W. M. Welch and Jay F. Schamberg (*Philadelphia Medical Journal*) give their experience in the Philadelphia Hospital for Contagious Diseases. They state that in one year's experience (after 1901) about three hundred cases of smallpox were treated at this hospital. Of this number not a single patient had been recently successfully vaccinated. The shortest period elapsing between a successful vaccination and the contraction of the disease was five years. In this case, which occurred in a boy of eleven years old, the eruption consisted of only a score of papules, which scarcely developed into vesicles, and dried up in a few days. It was not found necessary to confine the lad to bed. While the majority of the patients admitted were unvaccinated, a very large number had been vaccinated in infancy. To the best of the writer's knowledge, none, save the boy mentioned, had been successfully vaccinated within the past ten years. The writers believe that it may be laid down as a rule that if a child be successfully vaccinated in infancy, and again at the age of puberty, the protection will be permanent. The exceptions to this rule, however, may be sufficiently frequent to warrant a repetition of the vaccination whenever there is exposure to smallpox. They prefer the glycerinated lymph in such cases.

Smallpox seldom manifests itself in the school, and

the only phase of this subject of interest is that of vaccination. Immunity from smallpox in recent years has made the people careless and even defiant of the laws governing vaccination. The "anti-vaccinationists" have in many places defied the school authorities who demanded compulsory vaccination among school children. It is strange that such a blessing can be so lightly looked upon; and it usually requires several cases of smallpox in a community before the people will avail themselves of the opportunity to be vaccinated. It should be borne in mind that vaccination and modern sanitary science have almost wiped smallpox from the face of the earth, and that any relaxation of the means that secured this desirable end may serve to bring back the scourge once more. All children should be vaccinated before entering school, unless the health officer can satisfy himself that the state of the child's health is such as would make the operation inimical to him.

Compulsory vaccination is demanded by most school boards and state laws. A number of complaints, however, have been noticed within the past two years, of laxity on the part of school boards in relation to the vaccination laws. In many cases it is because the parents do not believe in efficacy of inoculation, or because they fear some evil result. But the proverbial vaccination

stories, telling of horrible results, are gross exaggerations, not to be credited, as in not one case in a thousand are any untoward results noted.

School boards should always require each child upon entering the schools to be successfully vaccinated. This means that if the inoculation fails to "take" at the first trial, it should be repeated again and again until it does "take." Usually the certificate given to a successfully vaccinated child when entering school is allowed to stand indefinitely; but as the immunity is supposed to disappear in from five to seven years, revaccination should be insisted upon from time to time.

When smallpox is epidemic in a community all the school children should be vaccinated regardless of previous scars. If the immunity still continues, the vaccination will have no effect, and if successful it only proves the necessity of the added safeguard. There may be some few children in a community who, for physical reasons, should be excused from vaccination; but the number rightfully excluded would be very small. Pressure is often brought to bear upon the physician by the parent for a certificate of exemption, and it would be wise for school boards to demand the signature of two physicians to such a certificate.

The U. S. Marine Hospital Service, in its bulletin on

"Smallpox," decries the necessity at all of such exemptions and pointedly says that there are only two classes in a community who deserve to be exempt—"first, those that have already had smallpox, and, secondly—those that are dead."

Chicken-pox is a harmless disease which has interest only from its liability to be mistaken for smallpox. It manifests itself in the shape of small, round rose-colored sores scattered over the body. But however mild it is in its nature, no child suffering from it should be allowed at school.

The three great "school diseases" of this clime, both because of their frequency of appearance and the seriousness of their nature, are measles, scarlet fever, and diphtheria. This does not mean that they are serious because they always destroy life, but because of the troublesome after-effects they leave upon the eyes, the ears, and the voice.

Measles, though the least likely to be fatal, is the most infectious of all, beginning to be so several days before the eruption breaks out. A child coming down with it exhibits symptoms of a severe cold; has headache, stoppage of the nose, tickling of the throat, sneezing, inflamed, watery eyes, and a hard, dry cough. The eruption is in the shape of small, red dots resembling flea

bites, first appearing on the temples and the forehead, and later spreading over the entire body. Pneumonia often complicates a case of measles, making a serious combination. A lingering cough or inflamed eyes and ears may follow. The patient should keep his bed for a week and his room for three weeks. If well by this time, he may rejoin his playmates. When a case enters a household where other children are, all should be enjoined from attending school. Epidemics of measles usually begin in cold weather.

Scarlet fever, or scarlatina, is a limited contagious disease caused by a specific germ, and characterized by fever, sore throat, and an eruption. This eruption is of a bright scarlet, forming first on the chest and the upper extremities. About the fifth day of the fever, the rash begins to peel off, and then especial care should be taken, as at this time the disease is most infectious. Contagion may come through such mediums as library or school books, letters, clothing, or toys. Chronic nasal catarrh, pneumonia, heart and kidney trouble, may complicate and follow this disease, but what is most of all to be feared is the ear trouble, where the drumhead becomes perforated and a chronic discharge follows. One observer, upon investigating causes of deafness in four hundred persons, found scarlet fever to be responsible for one hundred and

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forty-four of that number. A child should not be allowed to return to school until four weeks after recovery, as the disease continues to be infectious long after the patient is apparently restored to health.

Of the common diseases incident to school life, diphtheria is the most destructive. In recent years, the discovery and use of antitoxin have considerably lessened the mortality, but it is still a difficult disease to combat. Its duration is usually short and its progress rapid. Its constant feature is the presence of a white patch or patches in the throat, accompanied by high fever and weakness. Many cases are of such slight nature and the constitutional symptoms so light that little notice is paid to the affection by careless parents, and the child continues at school, infecting all about him. Peculiarly enough, however, the mildest case of this disease may infect another child with the most violent type.

If there should be no medical inspector connected with a school, it is an easy matter for the teacher, in all cases of "sore throat" coming under her notice, to make an examination by depressing the back portion of the tongue with a small, clean piece of wood. If there are shown in the throat any small white spots or patches, the child should be immediately sent home to be examined by a physician. It is true that white patches in the throat

do not always indicate diphtheria, but the teacher should not be expected to differentiate. That can best be done by a physician, and then only after a culture is taken from the throat to be examined under the microscope for the detection of the presence of diphtheria bacilli. Diphtheria patients should be carefully isolated and pupils from the same family kept from school. The child may be returned to school, if good disinfection has been carried out, three weeks after recovery.

Whooping-cough is a disease far too lightly considered both at home and at school. Ordinarily, little attention is given to it by the school authorities. Children are often allowed to continue at school while suffering from it, infecting those around them at every cough, and annoying all present by each spasmodic outburst. And, although in most cases the child recovers, whooping-cough is far more dangerous than is usually supposed. Dolan ranks it third among the fatal diseases of childhood in England; and Smith, in New York, states that one out of every seventy-six deaths there is due to whooping-cough. It is not alone in the disease itself that the mortality lies, but in the complication so often resulting, such as convulsions and pneumonia. Children with this disease should be kept from school until the physician certifies to complete recovery. Unfortunately, the dis-

ease is a long-standing one, running from six weeks to as many months, and parents will protest strenuously against having the child excluded from school for this long period of time. There is no alternative, however, when we consider the extreme contagiousness of whooping-cough and the great distress the infliction of the disease on others would cause.

Tuberculosis, or, as it is popularly called, consumption, is sometimes encountered in the schoolroom. Since the discovery by Koch of the cause of tuberculosis, the conviction of late years has grown that this disease is communicable and to a great measure preventable. With a view to preventing the spread of tuberculosis, the Board of Health of New York City issued the following instruction:

"Consumption is a disease which can be taken from others and is not simply caused by colds. A cold may make it easier to take the disease. It is usually caused by germs which enter the body with the air breathed. The matter which consumptives cough or spit up contains these germs in great numbers: frequently millions are discharged in a single day. This matter, spit upon the floor, wall, or elsewhere, is apt to dry, become pulverized, and float in the air as dust. This dust contains the germs, and thus they enter the body with the air breathed.

"The breath of a consumptive does not contain the germs and will not produce the disease. A well person catches the disease from a consumptive only by in some way taking the matter coughed up by the consumptive."

A child known to be suffering from tuberculosis must of necessity be excluded from school. With this disease the outward signs noticeable to a teacher would be cough, paleness of the skin, difficulty of breathing, and weakness. Any pupil who continues to cough for some time should be examined and a physician's opinion be requested as to whether the trouble is contagious. Expectoration upon the floor should be forbidden at all times, whether a cough be present or not.

Mumps, or parotitis, is an acute infectious disease, outwardly manifested by swelling of the parotid gland, which lies immediately below the external ear. Mumps will be encountered in the schoolroom more often than any of the diseases previously spoken of, as the child usually complains but little of sickness, and the infectious nature of the ailment is not rightly recognized. It is not dangerous to life, but should be guarded against by refusal to admit any child suffering from this disease.

Typhoid fever is very apt to manifest itself during school life, as a large number of cases occur between the ages of five and fifteen. Besides being an especially

dangerous disease, it deprives the child of the advantages of school for a long period of time, often many months. It is known to be contagious, and often the avenue of the disease is polluted milk or drinking water. If the water of a school is from the public water supply of a city, there are authorities who are supposed to analyze it carefully from time to time for the presence of any disease-breeding impurities. If the supply be on the grounds, from a well, it should have a careful analysis at least twice a year to determine its purity.

Should two or three or more cases of typhoid fever be reported from a single school, the closest examination should be given to the building, lest the cause should be there. The water supply, the drainage, the closets, and the cellar, should be the subjects for investigation.

Typhus fever, cerebro-spinal meningitis and erysipelas are contagious diseases which it will usually require a physician to discover. When epidemic, they require the same precautions as spoken of with the foregoing diseases.

Certain inflammatory diseases of the eye and skin are contagious. Any child found with sore, watery eyes, or scabby sores upon the body, or that peculiar skin disease known as "ringworm," should be sent out as being the subject of a contagious disease. In some of the large

centres of population contagious eye diseases and ringworm are a source of great concern to the school authorities. In New York City, in 1902, out of 55,000 pupils examined, 6,670, or about 12 per cent. were suffering from contagious eye diseases; 2,328 of this number had trachoma (granular lids). Ringworm has been especially common in the larger cities, where the foreign element predominates. It is a stubborn disease to combat and lasts many weeks. In order that those suffering from it may not be deprived of all their school benefits it has been recommended that separate schools be opened for those suffering from ringworm or trachoma. This expedient has been successfully tried in parts of Italy and Belgium.

The diseases described are all, to a greater or less extent, communicable, and also largely preventable. No greater good can be done in school work than by the study and application of hygiene to prevent these same diseases, which annually make such ravages among children. The diseases for which pupils are excluded from school attendance are scarlet fever, diphtheria, tonsilitis (in Philadelphia and Detroit), measles, mumps, chickenpox, whooping cough, pediculosis, scabies, impetigo, tuberculosis, smallpox, and trachoma. No matter how carefully children may be cared for at home, they must rub shoulders with others who know little of the laws of personal cleanliness. At home a child may drink only

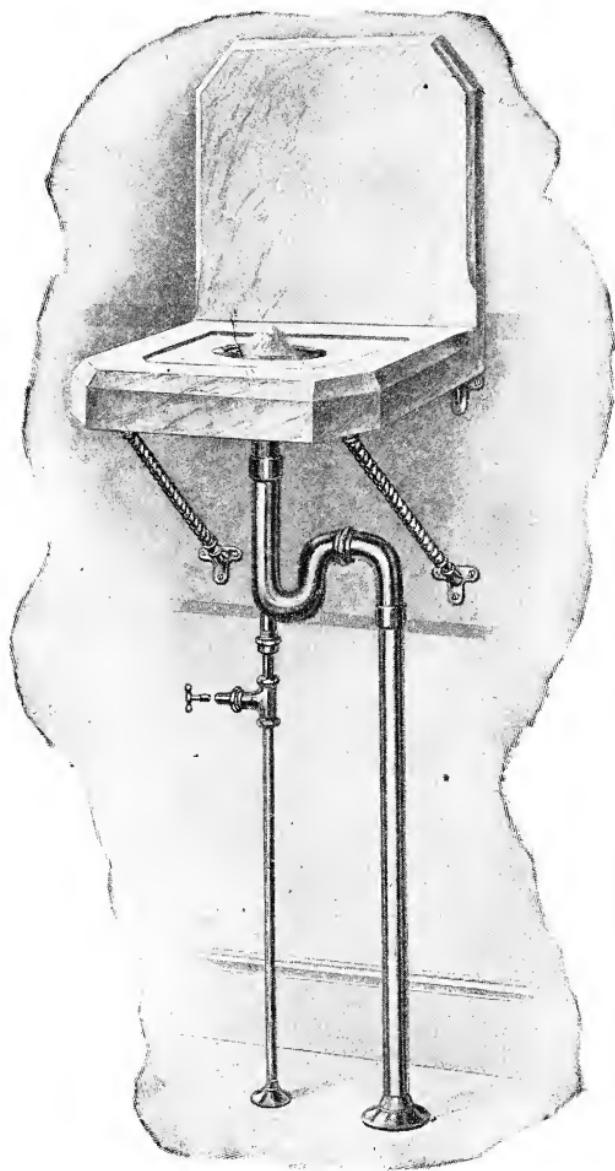


FIG. 26.
Sanitary Drinking Fountain.

from his own cup, but at school he too often drinks from a filthy tin dipper that a hundred lips have touched that day. The wonder is that disease is not more common in our schools. It behooves us, then, to study all conditions that will serve to lessen this great interchange of disease.

First, we must revert to ventilation again, and consider that disease germs find a paradise in a close, poorly ventilated room. We should also abolish the common drinking cup. It should not be tolerated for one day in a schoolroom. Each child should have a marked cup of his own and use that only.

An admirable means of preventing the spread of many diseases is by substituting for the drinking cup or tin dipper a drinking fountain, which has been patented, by means of which the pupil, pressing a small lever in the floor with the foot causes a gentle stream of water to be thrown upwards. The child places the lips to this stream and drinks; the water flows back into a basin and out. Removal of the foot from the lever stops the supply of water. The great advantage is that the child drinks readily and without touching the lips to any cup or dish of any kind. This appliance in actual use is shown in the illustration opposite. Too much cannot be said for this device; its general use would undoubtedly cause a marked diminution of contagious diseases.

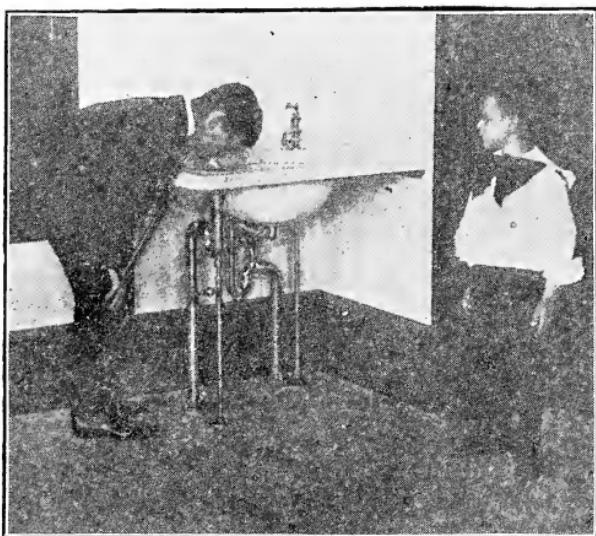


FIG. 27.
Sanitary Drinking Fountain in use.

The pupil should be enjoined from the very common habit of wetting the thumb or fingers with saliva to turn the leaves of a book. This is an unsanitary practice and an easy way of introducing disease germs into the mouth.

The practice of carrying home books or other school articles should be carefully looked after and forbidden in cases where contagious diseases exist. If, by some oversight, such articles are left at homes where there are such diseases, they should be thoroughly fumigated with formaldehyde vapor before they are returned to the school. This fumigation can easily be carried out by placing the books and articles in question in a small closet, closing the door and stopping up the keyhole and burning one or two formaldehyde candles. The books should be set on edges with the leaves opened as much as possible. When smallpox, diphtheria, or scarlet fever is epidemic in a community, the carrying of any articles from school to home should be prohibited.

The use of pencil and slate is rapidly passing away, and the pad of paper and lead pencil are being substituted. It is impossible to keep the old slate clean, and usually the attempted cleaning is done with saliva. Its use also involves the necessity of sponges and slate cloths, which are ready germ catchers. When slates are in constant

use it would be well to have them washed weekly with a 1 to 5,000 solution of bichloride of mercury.

No common towel should be used at school. Contagious skin and eye troubles find a ready mode of interchange through the towels. If they are at all necessary, there must be one for each pupil. Schools that are in use both day and evening demand extra care in regard to ventilation and cleanliness.

When a severe epidemic visits a particular school, neighborhood, or city, there should be no hesitancy in closing all the schools endangered. This, as has been proved repeatedly, will usually suffice to stop the spread of the disease. Dr. Walford, an English medical officer of health, says: "I am aware that it is frequently stated that on the closure of schools, children will play together in the streets or meet in houses, and that the epidemic will thus spread still more. Doubtless under these circumstances, there is a probability of some infected children coming in contact with healthy ones, but the danger of spreading the infection must be infinitely greater when a large number of children are congregated together for hours in overcrowded and badly-ventilated schoolrooms."

If, during the prevalence of an epidemic, the schools are not closed, it is feasible and advisable to fumigate the rooms often by the use of formaldehyde vapor. This can easily be done by the janitor after school hours. The

following method of disinfection of a room and its contents is recommended:

“1. All cracks or openings in plaster or floor and about the door and windows should be closed by cotton or strips of cloth.

“2. The books, papers, pencils, etc., should be spread out upon desks, chairs and tables in order to expose as much surface as possible to the disinfectant. They should not be thrown into a heap.

“3. For each 1,000 cubic feet of space 150 centimeters (five ounces) of formalin should be placed in the distilling apparatus and distilled as quickly as possible.

“4. The keyhole and spaces about the door should then be packed with cotton or cloth.

“5. The room should then remain closed for at least ten hours.”

The use of disinfectants such as a solution of carbolic acid (one part to fifty parts of water), mercuric chloride (one part to a thousand parts of water), and permanganate of potassium (one part to a thousand parts of water), about the water-closets is always advisable, and especially so in epidemics. Many janitors place too much reliance on disinfectants, and think that no matter how filthy a corner may be, liberal sprinkling of chloride of lime, or some such agent, will immediately purify it. The best disinfectant is cleanliness, which

should always be the advance guard of the other means employed.

Schools that have the benefit of the daily examination of the medical inspector are indeed fortunate, as the burden of a great responsibility is taken from the teachers. In schools not so fortunate, the teacher should make careful daily inquiries regarding the health of the pupils and also the health of the other inmates of the pupils' household. In this way many contagious diseases will be discovered and reported to the proper official for investigation. Many families treat, without a physician's aid or any attempts at isolation, such diseases as diphtheria, measles, and scarlet fever, often being afraid to report to the Health Board, lest the laboring members of the family may be denied their usual work.

Every school board should adopt careful and stringent regulations regarding contagious diseases and the school. The Health Board of the City of New York has approved a number of recommendations suggested by Professor Herman M. Biggs, the department bacteriologist, and ordered that a copy be sent to the Board of Education. Some of the recommendations are as follows:

"1. The use of slates, slate pencils, and sponges shall be discontinued in all the public schools.

"2. According to requirement, pupils shall be supplied

with pencils and penholders, each pupil to retain those received in a box provided for the purpose, such box to be marked with the pupil's name. Pencils and penholders shall not be transferred from one pupil to another without suitable disinfection.

"3. All school property left in the school building by a child sick with any contagious disease, and all such property found in an apartment occupied by a family in which a case of smallpox, typhus fever, diphtheria, scarlet fever, or measles has occurred, shall be taken by the Health Department for disinfection or destruction.

"4. Books which are taken home by pupils shall be covered regularly once a month with brown manila paper.

"5. Places for drinking water on the ground floors of the school buildings shall be discontinued, and a covered pitcher provided for each classroom, in which fresh water shall be placed before every session. A numbered cup to be kept in the classroom shall be issued to each pupil. No interchange of cups shall be allowed.

"Provision is proposed for the exclusion of children in whose homes there may be cases of contagious disease, and for a report by teachers to the Board of Health of all cases of sickness among the pupils. Finally, the recommendations provide for more closet room for hanging

clothes, and prohibit principal and teachers from sending one pupil to the house of another for any reason."

Teachers or the medical officer should teach the pupils the great advantages of daily bathing and the immunity from contagious diseases it affords. The medical director of a boys' boarding school in England stated that the daily practice of head to foot bathing in his school reduced infectious diseases to one-third of the number previous to the establishment of this practice. In some schools instruction must go still farther; children should be encouraged to be clean in person and clothes, especially the underclothes. So much of disease is given off by the skin and so much disease finds its way into the body through the skin that it is essential for a healthy body to have a clean, active skin. This cannot be had when changing of underclothes is neglected and accumulated dirt blocks up the small invisible pores of the skin.

Often a teacher may wish to know whether a complaining child is really ill or only affecting to be so. During the presence of an epidemic it would be wise for the teacher to take the temperature and pulse of the child. To obtain the temperature, or bodily heat, it is necessary to have a small clinical thermometer, the bulb of which is placed underneath the tongue, with closed lips, and allowed to remain there three minutes. Normally, when removed

it should be 98.2°F , and any elevation of this should be noted and the child sent home. When a thermometer is used, it should first be thoroughly cleansed and shaken so that the mercury will stand lower in the column than the normal point. The pulse of healthy children of school age will vary from 72 to 80.

School children may return to school in ordinary cases after :

Diphtheria, when two negative cultures have been obtained;

Scarlet fever, three weeks after recovery, or when peeling has ceased;

Measles, two weeks after recovery;

Whooping cough, when cough has ceased;

Mumps, when swelling has disappeared;

Chicken-pox, when skin is free from crusts and scabs.

Smallpox, one month after disappearance of all crusts and scabs.

During the continuance in a household of scarlet fever, diphtheria, or smallpox, all other children, as well as the infected case, should be excluded from school.

CHAPTER XI

MEDICAL INSPECTION OF SCHOOLS

Among the diseases known commonly as "school diseases," some have been discussed as being contagious, others as non-contagious; but all are to a greater or less extent preventable, either by discovery and isolation or by better application of hygienic detail. Within the last decade, in the larger cities of this country and Europe, the plan has been adopted of having a regularly appointed medical officer, whose duties are a daily examination of all suspected illness, whether contagious or not; a regular examination of each child's sight, hearing, and seating; and an investigation as to proper heating and ventilating of the schoolroom. At first some objections were raised to the adoption of such a practice. The expense was deplored, but in most instances the fees of the inspector were fixed at a merely nominal sum of one or two hundred dollars a year. Some physicians selfishly objected, protesting that the discovery of some of the "school diseases" would serve only to enlarge the practice of the inspector; but the rules formulated gave the inspector no

authority to prescribe medicines. The child was sent home and the case treated by the family physician. Being a new thing, it, like many other innovations beneficial to the people, was looked upon by some with little favor. But the establishment of school inspection in a city meant always its retention, for the benefits derived were conspicuous and the only wonder was at the folly of having lived so long without it.

In Boston, for the first fourteen months of medical inspection, 16,700 cases were examined, and during that time were discovered 77 cases of diphtheria, 28 of scarlet fever, 116 of measles, 28 of chicken-pox, 69 of pediculosis (lice), 47 of mumps, 33 of whooping-cough, 47 of scabies or contagious itch, 8 of congenital syphilis, a large number of contagious diseases of the eyes, and 2,000 cases of follicular tonsilitis. Following is the report of the health department of the city of Boston for 1900, when there were examined by the medical inspectors of the public schools 15,573 children.

Specific infectious diseases.....	505
Oral and respiratory diseases.....	2,609
Diseases of the ear.....	37
Diseases of the eye.....	431
Diseases of the skin.....	3,421
Miscellaneous diseases.....	3,568
Found free from disease.....	4,952
	<hr/>
	15,573

Of the infectious diseases, there were: diphtheria, 23 cases; scarlet fever, 23; measles, 121; whooping-cough, 62; mumps, 107; chicken-pox, 108; influenza, 50; erysipelas, 2; syphilis, 3; tuberculosis, 2; malaria, 4. There were 438 cases of acute pharyngitis, 1,281 of acute follicular tonsilitis, 58 cases of adenoid disease, 220 cases of imperfect eyesight (without visible cause), 337 cases of eczema, 227 of impetigo contagiosa, 2,316 of pediculosis (lice,) 42 of scabies (itch); of tinea fayosa and tinea trichophytina (ring-worm), 172; of headache (habitual), 206; of urinary diseases, 29.

In New York city, during the first four days of medical inspection in the public schools, 400 cases of contagious disease were discovered and dismissed from school until danger from contagion had passed. The report of the results of medical inspection of the public schools in New York city shows that for the quarter ending June 30, 1897, there were 220 schools inspected each day by 149 medical school inspectors. The total average attendance was 149,520. Of this number, 63,812 children were examined as suspects, of whom 4,183 were found to be affected with some contagious disease and excluded from the schools. This makes over six per cent. of the total examined. Of these cases of contagious diseases, 167 were cases of diphtheria; 32 scarlet fever; 88 measles;

11 croup; 26 whooping-cough; 117 mumps; 702 contagious diseases of the eye; 2,627 parasitic diseases of the head, 108 of the body; 130 chicken-pox; 175 skin diseases.

Of the true cases of measles and of scarlet fever all were in the stage of desquamation. This would naturally be the case, inasmuch as these diseases, in the beginning, are marked with a certain amount of fever and discomfort which leads the parents to retain the children at home, after which the rash appears, and the case is then excluded from the schools. But there are certain cases in which the constitution of the patient is such that the fever is unappreciable; and the child, having a slight rash only, is given little notice by the parents, and continues at school until desquamation occurs, when probably a new crop of cases will be produced.

To quote the report: "As a rule, among a large number of people having children that attend school, no dread of these diseases, so common to childhood, is felt; and either through indifference or selfishness they refuse to believe that these diseases are avoidable, and often oppose the use of the proper means for their prevention.

"A glance at the totals of the various diseases for which children have been excluded during the sixty-five school days of the past three months shows the carelessness and ignorance of many parents in regard to the spreading of

infectious and contagious diseases. Not thinking of, and, perhaps, not caring about, the danger, they send their children, carrying the germs of these diseases, into the crowded schoolroom, and necessarily expose, and, no doubt, infect many other children.

"These results also show the importance of the medical school inspection as one means of preventing the spread of these diseases; and with this work further extended and perfected, and with the education of the parents and guardians as to the necessity of keeping infected children at home, we shall be able to reduce the number of these diseases among the children of this city."

In 1903, the first year of medical inspection in Providence, R. I., "1,018 children were found to be in an abnormal condition. Three had diphtheria; five, scarlet fever; twenty-three, German measles; eighteen, enlarged tonsils; and 182 cases of adenoids were found. In the latter cases much of the backwardness of the children is accounted for, and in the discovery of that malady alone, say the physicians there is sufficient evidence of the merit of the inspection, as by prompt treatment of the throat growth those 182 children will be placed in a condition on a par with healthy children. Much also of the supposed ignorance of the children will have been done away with, as that particular trouble affects greatly the faculty for learning. There were thirty-one children

found to be affected with ear trouble, seventy-two with petty eye troubles, and nearly 160 with imperfect vision, 133 had skin diseases, ten had spinal trouble, and five had paralysis. Twenty were adjudged to be mentally deficient."

The Bulletin of the Department of Health of Chicago, of March 2, 1907, shows that of 48,155 pupils examined, 7,205 or nearly fifteen per cent. were at that time suffering from a communicable disease. In Massachusetts, during the school year of 1906-07, out of an average school attendance of 343,000, 27,342 were reported as suffering from diseases and defects demanding attention.

From statistics gathered from medical inspectors' reports in Berlin, New York, Boston, and Chicago, it appears that about six to fifteen per cent. of the pupils attending the average public school are suffering from some one or other of the diseases enumerated, and are a source of danger to those with whom they come in contact. The medical profession has co-operated to the extent of giving its services at a very moderate figure: no school, then, in this broad land should be without a medical officer. It needs no stretch of imagination to believe that if this practice is made general, thousands of lives of children will be saved, and thousands by this protection be spared the ordeal of long periods of illness and the enforced loss of valuable time at school.

Dr. Reynolds, health commissioner of Chicago, says that he knows of no other single living effort in which his scanty force of inspectors has engaged that has been of more obvious and direct benefit to the community in general, as well as to the school children themselves.

In Berlin, after a serious epidemic of measles which paralyzed for a time the school system, public meetings were held; and the following resolutions were adopted and afterwards put into practice:

"Laymen and physicians demand that each school have a physician assigned to it, to have charge of the general hygiene of the building and be watchful over the health of scholars; to see to the proper heating, ventilation, cleanliness, and, if necessary, disinfection of the building; to order the closing of the school when the heat becomes excessive, and in times of epidemics; furthermore, to examine new scholars; in short, the physicians should protect the scholars against the dangers of school life."

Dr. Samuel H. Durgin, chairman of the Boston Board of Health in 1897, describes the working of the system in Boston. The Board of Health divided the city into fifty districts, giving an average of about four schoolhouses and fourteen hundred pupils to each district. No difficulty was experienced in finding well qualified and discreet physicians who would undertake the duties pre-

scribed, and the board selected and appointed a physician for each district with a salary of \$200 a year. His duty is to make a visit to each master's school daily, soon after the beginning of the morning session. The master receives from the teachers in his district early reports as to the appearance of illness in any pupil in their charge; these reports are given to the visiting physician, who at once examines the reported children and makes a record of his diagnosis and action in books furnished by the Board of Health for this purpose and kept in the custody of the master. If the visiting physician finds the child too ill, from any cause, to remain in school, he advises the teacher to send the child home for the observation and care of its parents and family physician. If the illness is from a contagious disease, the child is ordered home and the case reported to the Board of Health. The disposition of the sick child while at home and the proper isolation in cases where contagious diseases develop in such children, as well as the giving of a warrant for returning to the school, depend principally upon the report of the school inspector.

The Health Department of New York City has the best and most specific rules for the medical inspectors. They are as follows:

"Inspectors are required to report at the schools to which

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they have been assigned from 8.50 to 9.30 A. M. every day that school sessions are held. They are to examine carefully each child that has been isolated by the teachers in charge, and cause to be excluded from school each one affected with, or showing symptoms of, any contagious or infectious disease, more especially the following: measles, diphtheria, scarlet fever, croup, whooping-cough, mumps, contagious eye diseases, parasitic diseases of the head or body, or chicken-pox. They shall furnish each pupil that is to be excluded with a printed card, upon which they shall note the date, name, and location of the school, the name, age, and address of the child, and the reason for the child's exclusion. These cards, signed by the medical school inspectors, are to be taken home by the excluded pupils. Each day, before leaving a school, each inspector is required to fill out a printed daily report blank, giving the date and time of visit, the name, location, district and card numbers of the school, the number of children examined (male, female, and total), the full name, age, and address of each one excluded, and the diagnosis of each excluded case. Note is also to be made on the daily report of any bacterial culture that has been taken, giving the clinical diagnosis, and stating whether the pupil was excluded or not. On the last school day of each week, the printed sum-

mary blank, on the back of the daily report blank used that day, is to be properly filled out for each school day of that week. Each day, as soon as possible after leaving the last school to be visited, inspectors are required to mail a separate daily report (properly folded and "backed") for each school visited, to the chief inspector at the central office, where a daily summary is made of the work performed in all the schools visited.

"All children excluded from school for measles or scarlet fever are visited at their homes within twenty-four hours by one of the diagnosticians of the board, and such cases are not tabulated as true ones unless he confirms the diagnosis, when a department postal card is sent to the school, excluding the child until after his complete recovery. When the necessary disinfection and fumigation of the rooms where the child lives have been attended to, a certificate allowing him to return to school is issued.

"Pupils excluded for chicken-pox are visited at their homes by the medical inspectors of the Division of Contagious Diseases having charge of the districts in which the children live; when they confirm the diagnosis, the cases are recorded as true ones, and the schools notified by department postal cards.

In cases of suspected diphtheria, when there is well-marked clinical evidence in the throat at the time of the

examination, the child is to be excluded, after a culture has been taken; when the clinical evidence is not well-marked, a culture is to be taken, but the child is not to be excluded until a report is received by the medical school inspector from the Division of Bacteriology, stating that an examination of the culture shows the presence of the Klebs-Loeffler bacilli.* In each case where an examination of a culture taken by a medical school inspector shows the presence of the Klebs-Loeffler bacilli, a notice to that effect is promptly mailed to the maker of the culture, and also to the medical inspector of the Division of Contagious Diseases in whose district the child resides, who then takes charge of the case as far as the proper isolation is concerned, taking subsequent necessary cultures, ordering disinfection and fumigation when the Klebs-Loeffler bacilli have disappeared from the throat, and issuing certificates for the child's return to school.

"The district medical inspectors have the same surveillance over each case of measles or scarlet fever where the diagnosis made by the school inspector has been confirmed by a diagnostician. When the result of an examination of a culture, made by a school inspector, is negative, a report to that effect is forwarded to the chief

* The Klebs-Loeffler bacilli is the germ that is the recognized cause of diphtheria.

inspector, but not to the maker of the culture. When the examination of a culture made by a school inspector does not admit of an exact bacteriological diagnosis, and a prompt confirmatory culture is requested, such request is mailed to the maker of the culture, and also to the district medical inspector, in order that a confirmatory culture may be taken by the former, if the child is at school, or by the latter, if the child should be at home. All cultures made by the school inspectors, accompanied by the 'culture blanks,' properly filled out and signed, should be promptly forwarded to the nearest culture station.

"Children excluded on account of whooping-cough, mumps, contagious eye diseases, parasitic diseases, etc., should be told to return when cured, and should be again examined before returning to their classrooms; if not entirely well they should be again excluded.

"The inspectors are required to ascertain from principals and teachers the names and addresses of all children from homes where there are contagious diseases, if notification has not been sent to the schools by the Board of Health; and such lists are forwarded with the daily reports. Inspectors keep daily records in blank-books, furnished for such purpose, of the number of children examined (male, female, and total), the full names, ages, residences, and causes for exclusion of those excluded from school, and a list of cultures taken and forwarded.

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"If, by reason of illness or other cause, an inspector is unable to report at a school, arrangements must be made with an inspector of another school to act as a substitute, and the chief inspector informed of the facts without unnecessary delay.

"If, in the opinion of an inspector, immediate action should be taken by the Board of Health in any case, he immediately communicates by telephone with the chief inspector. Medical school inspectors report at the central office once during each month. Exclusion cards for pupils, daily report blanks, addressed envelopes, blank-books for recording the work performed, wooden tongue depressors, culture outfits, and lists of culture stations, are furnished at the office of the chief inspector.

"The daily duties of medical school inspectors cease when they have mailed their reports, after leaving their schools. They are not, under any circumstances, to visit children at their homes, to prescribe for them, or suggest treatment at the schools. The treatment must be received from the family physicians, in the dispensaries, or in the hospitals."

NOTE. After the necessary disinfection and fumigation of the rooms in which there has been an infectious or contagious disease, postal cards are mailed by the Division of Contagious Diseases, notifying the proper schools that it is safe to readmit the child or children living in those rooms.

There should be no opposition from the parents, on the ground of interference with the child's liberty; on the contrary they should be pleased to know that their child is daily under a trained eye of a person who can more readily detect the onset of disease than they can, and whose only duty is to separate the infected child from his fellows, both for his own good and the good of the whole. Then, too, it must not be forgotten that disease will be earlier detected in its course and treatment begun at a more opportune time and with far better results.

Under a perfect system the inspector will have manifold responsibilities. His duties will embrace regular examination of the eyes and ears. In this particular alone he will forestall measureless sufferings and thanks to him these organs will be preserved for a more useful future. By this same system of inspection he will avert many cases of spinal distortion and stooped shoulders, by seeing that each pupil is assigned a seat and a desk that is fitted to him and comfortable to use. Everything in the building that relates to its hygiene should be under his watchful eye. The heating, the temperature, the ventilation, the disinfection, and the sanitary closets would then be supervised by one competent to know the exact requirements of all these departments.

The school authorities outside the principal cities of our country have been slow to make use of the great advantages of medical inspection. It is not a fad,—it is an ideal application of the “ounce of prevention.” No school is too large for its scope and none so small that it can dispense with it. It is a safe prediction that another decade will find the practice general. Delay, therefore, in instituting the regular inspection of schools is not wise; it is better to be a leader in a good movement, no matter how unpopular the movement may be at first, than to be dragged into it later from fear of the shame of standing opposed to public good.

NOTE.—Medical inspection was primarily established for the discovery and prevention of communicable diseases, but no small part of its effectiveness has been its effect in non-communicable diseases, as the following record of children examined in New York city from March 28 to December 23, 1907, will show :

Number of children examined.....	55,332
Cases of bad nutrition.....	3,823
Anterior cervical glands.....	14,214
Posterior cervical glands	3,047
Chorea	738
Cardiac disease.....	895
Pulmonary disease	600
Skin diseases.....	989
Deformity of spine	485
Deformity of chest	401
Deformity of extremities.....	498
Defective vision.....	16,394
Defective hearing.....	1,296
Defective nasal breathing.....	6,182
Defective teeth.....	18,182
Defective palate.....	689
Hypertrophic tonsils	8,347
Posterior nasal growths.....	51,119
Defective mentality.....	1,210
Number of cases treated.....	33,551

CHAPTER XII

MODERN EDUCATION AND HEALTH

If one were to take note of the physical condition of children entering school, and again of the same children graduating from the high school, it would be found that many had suffered physical deterioration by this educating process.

The brain has been improved and developed and the body allowed to care for itself. If the school work lags behind, if the brain works badly, there are the teacher, the principal, and the superintendent to be consulted about it—yes, even the parent receives notification that the child's work is not up to the standard. If the bodily strength is not up to par, who cares? If the cheeks of the little one fade day by day, and the shoulders become more stooped and the chest more hollowed, who is notified? Again, the child may keep the school work up to the standard, perhaps be the star pupil, and yet be poorly nourished, pale, sickly and undersized. No one regulates the amount of work to be done; the brain is stuffed while the remaining organs of the body are starving.

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Spurred on by teacher and parent, who see no limit to human endurance, the infant prodigy is developed and finally goes the way of all infant prodigies.

Every physician knows that his family practice annually brings cases worn down by school work. The major share of the cases is found among the girls, who usually are more serious students than the boys, and do not enjoy the invigorating exercises of the latter.

Dr. S. Weir Mitchell, than whom there is none better qualified to speak on this subject, says: "I believe that, as concerns the future of our women, they would do far better if they were more lightly taxed, and the school hours but three or four a day until they reached the age of seventeen. Anything, indeed, would be better than the loss of health, and if it is a question of doubt, the school, unhesitatingly, should be abandoned or its hours greatly lessened, as it is at least in part the source of very many of the nervous maladies with which our women are troubled.

"Overwork of the brain is a serious evil to women at the age of womanly development, when the nervous system is so sensitive and irritable, and at no other time is an abundant supply of fresh air and exercise so important. The American woman to-day is perhaps, of all civilized females, the least qualified to undertake the weighty tasks

which tax the nervous system of women. How few mothers are there to-day, in the higher educated class of women, who have rushed through college and played the devotee to fashion and society that can nurse their offspring!"

Dr. W. W. Potter, in his address as President of the Medical Society of the State of New York, said: "The years between ten and fourteen are full of import for a girl: during them she lays the foundation for future weal or woe, and I hesitate not to declare that this is a period of infinite responsibility for mothers, perhaps the greatest of any part of the educational life of their girls. Many girls begin their new physiological life at the age of twelve; but, if they should not do so quite as early, this is still a period when nature is making preparations for a new existence for the young female, and if her plans are interfered with or thwarted, even in their smallest details, years—long, sorrowing years, perhaps—of pain and suffering and woe are sacrificed to the shrine of ignorance or wilful neglect. The scholastic training of girls is being carried on with its greatest vigor at the very time when they are physically least suited to bear the strain. Just when the ovary is beginning to require a large expenditure of nerve force, the brain, under our present system, is demanding all that an active cerebration can produce, and oftentimes even more.

"I am heartily in favor of the higher education of women, but am thoroughly opposed to the present system of female education. Too much is attempted in the time allowed in preparatory schools. It were far better to have fewer studies thoroughly comprehended, than to attempt to cram with a number that can only be superficially acquired in the time allotted to them. Notice some of the star pupils who have been 'prepared' for exhibition. That girl is a 'bright' scholar. She is a chronological almanac, and can tell every date in English history from Cæsar's Invasion, or tell of all the battles the world has known and the number of the fallen; will tell you in an instant if one pipe empties a pond in seven hours and another in four, just how long it will take two to do it. She will lead you at a lively pace through the labyrinth of compound restrictive clauses with parrot-like precision, but it is simply mental discipline; a simple, real, face-to-face problem will cause her to falter and stumble."

The present generation, taking heed to the hundreds of physicians who have decried present educational methods and their physical results, is just beginning to show faint signs of improvement. But even yet there are too many schools, both private and public, conducted along the same line as Dr. Blimber's school, described by Dickens in *Dombey and Son*.

"Dr. Blimber's establishment was a great hothouse in which there was a forcing apparatus constantly at work. Mental green peas were produced at Christmas, and intellectual asparagus all the year round. Nature was of no consequence at all; no matter what a young gentleman was intended to bear, Dr. Blimber made him bear to order somehow or other. This was very pleasant and ingenious, but the system of forcing was attended with its usual disadvantages; there was not a right taste about the premature productions, and they didn't keep well. . . . And people did say that the doctor had rather overdone it with young Toots, who, when he had whiskers, left off having brains."

Savage nations have always held education in small favor, finding by experience that the school acted badly on the bodily health of their children. Dr. J. H. Kellogg, of Battle Creek, Michigan, cites an example of personal observation that emphasizes well this point:

"Some years ago, while spending a short time among the Yuma Indians, in the vicinity of old Fort Yuma, Arizona, I observed one morning a considerable number of old warriors and chiefs gathering in from the forest and collecting in the old fort. Upon inquiring I found there was to be an Indian school-meeting, the first one ever held among the Yumas.

"The school had been started some two years before by Sister Alphonse and two or three other devoted Catholic sisters, who had ventured into the wilds of Arizona to undertake the experiment of educating the Yuma boys and girls; but their school had not prospered. The children had been kindly treated; they had been supplied with an abundance of food, whereas before they were often hungry; they had been furnished with clothing, including hats, bonnets, shoes and stockings, whereas before they had roamed the forest in nakedness. The schools were furnished with all the necessary modern appliances and the teachers labored earnestly in behalf of the students.

"Nevertheless, Sister Alphonse confessed to me that the school was not a success, and that the old Indians were very much opposed to it. I inquired the reason for their opposition, and was told that the Indians complained that going to school did not agree with the health of their children; that after having been in school a few months they were far less robust and vigorous than before, and that they suffered from indigestion, catarrh, and other diseases, from which they were before as free as the birds, the antelopes, and the prairie dogs among which they lived. The good sisters honestly admitted that the complaint of the old Indians was not without foundation and that it was true that for some reason the little wild

children of the forest began to lose their vigor and vivacity soon after entering school, and therefore some of the most sagacious parents had kept their children at home.

"The school meeting had been called for the purpose of presenting to the old Indians the advantages of an education, so as to convince them, if possible, that the children would better have an education even if the getting of it should spoil their stomachs, weaken their lungs, destroy their keen sense of smell through catarrh, impair their eyesight, dull their hearing, and deprive them of the hardihood which had enabled them for centuries to maintain the independence which they still possessed.

"I did not remain to hear the conclusion of the matter, but a few years later, in passing through the country on a visit to the Pacific Coast, I spent a day among the same Indians. I found the school flourishing, to the great delight of the good sisters, but the children perishing. Their forest air of rollicking freedom had disappeared, and the evidences of physical depression and deterioration were unmistakably apparent. Civilization had conquered, and the Indians had become convinced that their children must be educated even at the expense of health and vigor."

With such undeniable proof of the unhealthy drift of

modern school methods, we should study to find the causes and remedies of the effects produced.

School children are prone to suffer from anaemia, indigestion, headache and neuralgia, insomnia, nervousness, chorea, and fatigue. Anaemia is a condition visible as a great pallor of the skin and weakness. It is the common complaint when a child is spoken of as being "run down." It is usually persistent in its course, appearing most often in girls, and sometimes is the herald of a lifetime of weakness and invalidism. Lack of exercise, too much confinement, and improper nourishment, are the commonest causes. Indigestion sometimes appears alone or accompanied by anaemia, and has usually the same causes. Headache and neuralgia claim many sufferers of school age, and are attributable to poorly ventilated rooms, over-study, eye-strain, and fatigue. Insomnia is most often noted among school children who worry especially over keeping up the work, or about examination time, when the brain becomes over-taxed.

Chorea, or St. Vitus Dance, is common in school life. It consists of irregular, involuntary contraction of muscles, sometimes with slight mental disturbances. At times the muscles of the face or neck, or the head itself, may twitch, producing horrible grimaces. It may be hereditary or be the result of exhaustive drains on the

nervous system from school work. Immediately, when this trouble is recognized, the child should be removed from school for his own sake, for the quiet it secures, and for the good of the remaining pupils. Careful observers have traced cases that were caused by children's imitating the movements of a real sufferer. The disease lasts in mild cases about ten weeks; in others six months or more. The child shculd not be returned until after a physician has pronounced the disease entirely cured, as in numerous cases too early return to school is followed by relapse. When hysteria is encountered at school the victim should be placed in a quiet room and left absolutely alone. Sympathy or attention from those around serves only to intensify the attacks.

Nervousness, the American national disease, is a hyper-excitability of the nerves, which shows itself in various forms. The most prominent symptoms are twitching of muscles, convulsive movements, drowsiness, headache, irritability, great restlessness, unexplainable fears, indecision, and inability to concentrate thought for any great period of time. In many cases it is hereditary, and in other cases acquired. If it be true that nervousness and its grown-up brother, nervous prostration, are so typically American, it would be national wisdom to find out how far they are caused by school work, and to attempt to cut them

off ere they have driven their roots into the very ground-work of the child's constitution. To begin with, children are sent to school too young for serious study. The kindergarten should receive children from four to seven years old. At seven years of age, at least no earlier than six, the real primary work may commence with the normal child. But if a child be backward in development, either mental or physical, his entrance into school should be delayed.

With children from six to ten years of age there should be two sessions of no greater length than an hour and a half each; from ten to fourteen, two sessions of one and three-quarters hours each; and for the remainder in public schools, two sessions of two hours each.

All medical men who have studied the school question hygienically have pronounced the school hours too long, and have proved that just as good results can be got from the plan of reduced hours as from the plan in practice to-day—even better intellectual and indubitably better physical results.

“Mr. Charles Paget, formerly M. P. for Nottingham, England, once tried in the village school on his estate at Ruddington a very interesting experiment. He was not satisfied with the general progress made by the boys, and he provided for them a large garden. The school

was then divided into two similar sections, one of which was kept to the ordinary school work for the ordinary hours, the other for half of these hours only, the rest of the school time being devoted to work in the garden. At the end of the term the half-time, or gardening, boys had excelled the others in every respect; in conduct, in diligence, and in the results of study."

This illustration is not overdrawn, nor at all hard to explain. A similar experiment was tried in this country in a school in which the girls at first excelled the boys. The boys were set free to play during one-half the former school hours. The result was that the boys soon overtook and excelled the girls.

If, then, better work is obtainable in half the time, where is the wisdom of such long hours? But, the answer comes, we have the schools and the teachers at our service, and in many cases the mother is glad for the time being to have the child cared for and her own burdens made lighter. All true enough, but too little reason for the child's confinement when health is in danger.

In communities where great crowding is the rule, and schools are opened in basements and every other available space, it would be far wiser to have relays of pupils in the regular school buildings. For instance, just as good results would be accomplished by having the first division

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come to school at 9 A. M., remain until 10.30 A. M., and be dismissed. At the latter hour school would then begin for the second division and continue until 12 M. At 1.30 P. M., the first division would reassemble and work until 3 P. M., when the last session of the second division would begin, lasting until 4 P. M. In this manner double the ordinary number could be housed and under better conditions than temporary quarters could provide.

The assignment of work to pupils, it is hoped, will some day be radically changed. As a measure of economy, the ordinary school is now divided into two or more classes. The pupils of each class, without regard to their capacity, are supposed to keep up with the work of their fellow pupils. It is true that the allotment of special work to each individual child would multiply the work of the teacher; yet this plan deserves serious consideration. In industrial life it has always proved impossible for a number of men to accomplish equal amounts of "piece work" unless the required amount is a very low one, so low as to be far below the ability of a great many. The same is true in school work. If an amount of work is allotted sufficient for the dull ones, it will be a too easy task for the brighter ones. The standard of work is therefore set high, and many are dragged along, doing more than their brain power should allow, and actually suffering

from the study imposed. Ideal conditions will only be found when the right measure of a child's capacity can be found and the required work can be made commensurate with it.

In America to-day all roads lead to specialization: the old-time general education, which was a conglomerate cramming, an educational potpourri, is fast giving away to specialties. The high schools and the colleges all have courses leading to definite departments of life without taking on the many useless frills. So, also, the work in the lower schools should be shorn of all that is useless. It is better that proficiency be attained in a few studies than to have a smattering of all.

Home study should be recommended only when absolutely necessary, and if the child's physique is below par, not at all. For children below the age of twelve, the hours at school, if used to the best purpose, take all of the time in which the brain should be used, and the additional home work, which is most often done at night, and by artificial light, destroys much of the bodily energy which could be used more advantageously. The same is true of the "extras," such as music, painting, and needlework. Many a growing girl is unable to stand the double strain of arduous school duties followed by hours of practice in accomplishments forced upon her by proud parents. The

parent is the true arbiter of the question, and if the "accomplishments" must be had, the time allotted for them should not be so great as to interfere with the regular school work. Dr. Halle of Berlin states that out of every one thousand young girls who begin to learn the piano before they are fourteen, six hundred are affected by some kind of nervous disease, while out of one thousand other girls who are not taught the piano only one hundred suffer in a like manner. The doctor recommends that the study of the piano should not begin until after the age of sixteen.

It is not proper treatment to keep a dull child after school for inefficiency. He may be one who has tried hard and is unable to come up to the standard. To keep him after school will surely make him duller. The school course should be a flexible one, and no tasks should be given to any pupil which he cannot accomplish during ordinary school hours.

Many pupils are able to keep up with their classes by dint of hard work, but find when examination time comes that the extra labor incident to review is too great. Then they succumb. More pupils suffer from headache, fatigue, and nervousness, at the time of, and after examination, than at any other period of the school year. For this reason many are now wisely pleading for the abolition

of completest examination as being useless and as exposing the pupil to physical harm. This reform could be carried through without loss to school work.

All of the many enumerated causes, either singly or combined, lower the force of the nervous and muscular system: the brain power is at a low ebb and physical strength also suffers. This is the state spoken of as fatigue. In this condition the child has not one-tenth of his normal power, his ability to concentrate is poor, and his retention is almost nil. In such cases a long period of rest from the school is advised. With milder cases, a lessening of the work, with opportunities for physical building up, will suffice.

The lessons should be short; when long, there should be pauses between. Best attention in school can be had during the opening hour of the morning, as the child's mind is then in best condition for work. Too often this valuable hour, which should be devoted to the most difficult studies, is given to miscellaneous exercises, interesting, it is true, but better adapted to a later hour in the morning, when fatigue has already made itself apparent. The best hours for school work are from 8 to 10.15 A. M.; the worst hour is from 11 to 12. From 1 to 2.30 P. M. is the third best, and from 3 to 4 the second best. Kemsies says the studies he found to be most fatiguing in order were: gymnastics, mathematics, foreign languages, religion, mother tongue, natural history, geography, his-

tory, singing, and drawing. In Paris, at the Lycée, the Minister of Education allowed a teacher to change the order of the work to accord more with his idea of the pupil's ability, and found that the work that usually required seven years was as well done in three and one-half. Lastly, the greatest enemy to fatigue was the old-fashioned recess, where the children were allowed ten or fifteen minutes of play. Teachers complained that this recess got the pupil's mind off the work. This is the simplest and best argument in its favor.

In order to present a clear mind for school work in the morning, it is very essential that a child have the requisite amount of sleep for one of his age.

The average amount of sleep required at

4 years old	is	12 hours.
7 "	" "	11 "
9 "	" "	10½ "
12-14 "	" "	9-10 "
14-21 "	" "	9 "

It will be difficult to attain to the ideal at once, but adherence to these suggestions will go a long way towards giving better bodies to our school children, probably with no loss to the mental faculties. It is useless to store a beautiful mind in an unhealthy body. The real education is a healthy combination of good mind and good body, for, as Paley says, "It is every preparation that is made in our youth for the sequel of our lives."

CHAPTER XIII

SCHOOL DIET

The subject matter of the present chapter has greater interest for boarding schools than for public schools. In the latter, however, it should be a subject for investigation by the teacher, that she may be able to instruct the pupils as to what foods and what quantities are most suitable during school life, when physical and mental growth are most exacting in their demands.

Parents, ordinarily, manifest little concern in the diet of the child, offering the same foods to one of tender age as are offered to the robust workingman. The excuse in many cases is that with moderate means it is well-nigh impossible to present a great variety, and economy forces all the members of the family to partake of the same eatables. Fortunately, this is false reasoning, for it is the truth that the most nutritious foods are those of least cost. Advocates of particular dietary fads, such as exclusively vegetable food, are not to be heeded, for experience has taught that with the school child a wise variety combining proper admixture of animal and vegetable

food is the most desirable. The proportion of meat at all meals for children should be small, preference being given to the so-called physiological food for children, cereals, vegetables and milk. Many parents of means are ignorant of these matters, and short talks by the teacher to the pupil will be productive of great good.

Many diseases are traceable to faulty diet. The system becomes debilitated because the food taken does not supply vital power enough to blood, bone and muscle. Disease setting in with such patients finds especially easy prey. Of one thousand pupils examined surely forty per cent. were really ill-nourished. Their pale, drawn faces and thin bodies told the tale, and carrying the investigation still further into the homes, many times it was found that the child was a voracious eater, but always fondest of just such foods as did not add to his mind or his muscle.

Children should rise from bed in the morning in sufficient time to eat their meals slowly, and not have to bolt a hasty breakfast. The habit of deliberate eating should be cultivated in youth. Food taken into the mouth in large portions and only partially mixed with the saliva gives the stomach three times the ordinary work. Soon this organ rebels and will be unable to digest food even if properly taken. Breakfast and supper should each

consume at least one half-hour's time, and the dinner three-quarters of an hour.

Young children from seven to fifteen years of age may find it too long a time to wait for food during the long sessions of the school. In such cases the parents should send a lunch to be eaten at a definite hour rather than sweets or fruit that will be nibbled at from time to time. Strange as it may appear breakfast is the meal most difficult to provide for the pupil. Often the anxious parent brings the child to the physician with the story that it is impossible even to force the child to eat upon rising from bed, and that day after day he goes to school with an empty stomach. Long before noon the child is weak and has a violent headache. Often this loss of morning appetite is due to sleeping in a poorly ventilated room, or, perhaps, to too late hours. The best remedy lies in providing plenty of fresh air in the sleeping room and in sending the child to bed in time to get sufficient sleep by early morning, when an hour can be taken for a walk or some exercise before breakfast.

The breakfast meal should consist of cereals, eggs or fish, bread and butter, fruit, milk or cocoa. If the tea or coffee habit is already formed, the drink should be served very weak, principally hot water or milk. But it is better for children to avoid tea and coffee altogether, as there is

no good derived from them, and their injudicious use often leads to such ailments as nervousness, indigestion, and constipation. It were better if meat were not served for the morning meal. The dinner should be at mid-day, and should comprise soups, meat, potatoes, and other vegetables, with some pudding, pastry, and fruit. The best meats for children are roast beef, beef steak, roast lamb, mutton, chicken, and bacon. Pork and veal are not suitable. Supper, to ensure a good night's sleep, should be an easily digested meal. Porridge or rice, with milk or cream, bread and butter with preserves, some light pastry and hot milk, with but small portions of meat and vegetables, are most serviceable. Many refuse to give meat and vegetables for this meal, but they may be eaten without harm by those over twelve years of age.

Alcohol should not be given in any form to children. Setting aside the moral question, from a physical standpoint the use of alcohol works only harm upon the child. It retards growth and induces nervousness and irritability. These words are intended as a warning to those among the poorer classes who serve beer to their children with the idea that it is good for them and will help their appetite. The belief that alcohol in any form is an essential part of a healthy diet or that it contains any considerable food value is no longer held by scientists whose opinion is of greatest value.

The Committee of Fifty, who gave closest inquiry into the alcohol question in 1902, reported:

"We believe that the occasional or moderate use is most likely to be harmful to young persons, and mainly because of the danger of leading to excess."

"They are not needed by young and healthy persons and are dangerous to them in so far as they tend to create a habit."

"They are useless as preventives of infectious or contagious diseases. On the contrary they appear to lessen the power of the organism to resist the effects of the cause of such disease."

If the beverage is not offered to children they do not desire it. Milk is cheaper and is incomparably better for them. There can be no excuse, then, for the use of alcohol, unless prescribed by a physician. In some of the debilitating diseases, in children suffering from anaemia and inherited consumption, it is sometimes prescribed in the form of a light wine, but its use should always be guarded. Milk is nature's ideal food, and a child's home education is neglected if he is not taught to drink it with pleasure. It should form a large part of the child's diet, be given at each meal, and even at night should a child wake up hungry. To persons who are charitably inclined and ever ready to help the poor, we suggest that it would be an excellent idea

to establish a fund for supplying a daily lunch of milk and crackers to the children in some of the schools whose ranks are filled mostly from the poorer people. A glance into these schools shows numbers of poorly nourished little ones who would be greatly benefited by a light lunch in the middle of the morning and the afternoon session.

Fruit makes healthful food for the young, and they should be given a bountiful share of it with their meals. Sweets, meaning thereby candies, would serve a good purpose in supplying a needed part of the sugar to the system, were it not a fact that so much is ordinarily taken as to destroy the appetite for the usual meals. Confectionery should never be a part of the school lunch: the same applies to pickles, a favorite relish which satisfies in some a craving for something bitter, but is of no use as a food.

For school diet, then, nutritious foods are to be used, the meals should be regular, the articles of food thoroughly masticated and slowly swallowed. The child should be taught to eat those articles known to be nutritious, even though he dislikes them at first. With a little patience, in the same manner that he can be taught to overcome any other repugnance, a child can be taught to eat and enjoy the foods known to be best for his particular period of growth.

CHAPTER XIV

PHYSICAL TRAINING AND EXERCISE

It is important that the school in exacting from the pupil five hours of daily concentration upon study should plan periods during the day when the mind can be rested and when pleasing, helpful exercises of the body be substituted for mental drill. This relaxation can be sought in any form of physical exercise desired, whether in regular studied calisthenics or in unrestrained play. Physical training will give the same power and control to the muscles that mental training gives to the mind.

Calisthenics should be as compulsory as any other work unless a child presents a certificate from a physician to the effect that the particular child has something in his physical make-up which forbids this work; but because a child is weak and delicate is no reason why the gymnastic work should be entirely prohibited. Such cases demand intelligent treatment, and necessitate a lessening in the period of time spent rather than an entire abandonment. It is important, then, that some study should be given to the question of the exercise most suitable to age

and sex, the proper time, and the amount of time to be consumed.

The calisthenics are best given during the first period of school work and should not take over fifteen minutes. By investigating it has been found that the exercises as carried out under the instruction of a physical director are very fatiguing if kept up longer than fifteen minutes. The principal reason for this is that the work is too serious and studied and the child takes it as a task rather than a recreation. Some very careful and observing educators have of late years recommended for the lower grades short periods of play at intervals during the school hours, with real games, which please and spur the child on, giving the desired relaxation from mental work.

The particular exercises given to the young are treated in books devoted to this special subject, but in general it is proper to insist that much of the work should tend to make the child stand erect, walk properly, and breathe well. Respiratory gymnastics can be taught in the school and the practice taken at any time; the training should teach that proper respiration consists not in quick, sudden gasps, but in taking deliberate long breaths that give extensive expansion to the chest. So important is the breathing capacity considered that all insurance companies in their medical examinations ask to know the

amount the chest expands from a deep exhalation to a deep inhalation. Further, it is a well known fact that people who continually breathe through the nose are less liable to infectious diseases and pulmonary complaints, and that those who sleep with the mouth closed never awake with the painful and disagreeable sensation of parched throat and cracked lips. It is impossible, however, in such a work as this to go over all the different exercises practised in physical training. These few points about respiratory gymnastics are mentioned only to call attention to the importance of the subject. Certain occupations, certain games, tend to develop certain sets of muscles; physical training benefits all muscles.

As a matter of economy, in a number of communities attempts have been made to have this line of work done by the regular teacher, who in turn was supposed to have received some training in the methods of physical exercise. This plan has always proved to be unwise; the work is never carried out as well or with such interest as when directed by a physical instructor.

Athletics in some form or other may be commenced about the twelfth year. If in the school gymnasium, they should be under the trained eye of some qualified person, as there is great danger of young children's over-exerting themselves in trying to do the same feats as their fel-

lows. In the gymnasium two half-hour periods, one in each session, are sufficient. Dr. Sargent urges that no violent exercise be taken until three hours after a meal.

The outdoor play is not so easily regulated as the indoor, but the pupils should be taught that no exercise is beneficial which is carried beyond the point of bodily fatigue. Horseback riding and bicycle riding are invigorating and healthful exercises. The wheel, however, should be used in moderation. The mooted question as to whether wheeling is a healthful exercise for girls is generally settled in its favor, if only the girls use some discretion and avoid long, violent rides and riding at the menstrual period. The chief trouble with boys who ride a wheel, is in getting them to ride in an upright position, their desire to be racers inducing them to assume a stooped position which is anything but beneficial. The principal exercises suitable for girls are golf, lawn tennis, swimming, fencing, and basket-ball. All are sufficiently exhilarating to be enjoyed and do not require the great endurance that some of the more rugged sports do. Baseball, football, rowing, boxing, wrestling, bowling, swimming, and running are the exercises that best please the boys. All should be learned and practised. Some have a good influence on one set of muscles, while others help the lungs, heart, and stomach.

Every teacher should interest himself or herself in outdoor sports and remember that the ideal pupil is the one that leaves the school with a strong mind to battle with the world and a strong body to carry that mind about in. There are too many children who are encouraged to spend their spare time at school and at home always with books that they may excel in their studies, and yet who are easily distanced later in the real school of life by their less intellectual but more sturdy fellows.

CHAPTER XV

CORPORAL PUNISHMENT

It is but a few years since the practice of corporal punishment was very general. Severe punishments and floggings were often resorted to, even to such an extent as to physically disable the pupil for a few days at the time. Schools in certain districts engaged their teachers upon muscular qualifications rather than mental. Thrashing was thought to be an essential to education, and if a pupil did not or would not learn the lessons, he had them "knocked into him." It is pleasing to note, however, that with the great improvement in all educational matters this practice has almost entirely disappeared. To-day better discipline is maintained in just such schools by young "school-ma'ams" who never wield the birch but have been carefully trained in properly handling school children. To-day the best teachers are those who find least need to resort to corporal punishment.

But there still goes on a discussion as to the necessity at any time of corporal punishment, by which we mean some pain or suffering inflicted upon the body of the pu-

pil for some offence against the school law. Many who have gladly seen its use lessened to a minimum contend very strongly that there still is a use for guarded corporal punishment in the schoolroom and that there are cases which cannot be successfully treated by other means. And there are undoubtedly some few, the bullies usually, who sneer at moral suasion and any corrections other than corporal punishment.

On the other hand there are those who insist upon the entire abolition of corporal punishment in schools, holding that it is never of any use as a corrective measure; that wherever allowed, it is abused; and that it is an endless source of trouble between teacher and parent. It is probable that the truth lies half-way between,—that in the great majority of cases other means should be resorted to, but that doubtless there are cases where, without the use of corporal punishment, no impression whatsoever can be made.

Rollin, the French historian so well known from his Ancient History, early in the 18th century wrote a "Treatise on Studies," in which he has well-defined views on the subject under consideration. The following are a few extracts:

"I. The first duty of the teacher is to study well the genius and character of children. To wish to place them

on the same level, and to subject them to a single rule, is to force nature.

“2. In education the highest skill consists in knowing how to unite, by a wise temperament, a force that restrains children without repelling them, and a gentleness that wins without enervating them.

“3. The short and common method of correcting children is with the rod; but this remedy sometimes becomes a more dangerous evil than those which one seeks to cure, if it is employed without reason and moderation.

“4. The only vice, it seems to me, that deserves severe treatment is obstinacy in evil, but an obstinacy voluntary, determined, and well defined.

“5. The teacher ought never to punish in anger, especially if the fault which he punishes concerns him personally, such as a want of respect or some offensive speech.

“6. Cuffs, blows, and other like treatment, are absolutely forbidden to teachers. They ought to punish only to correct, and passion does not correct.

“7. It is a quite common fault to make use of reprimands for the slightest faults which are almost inevitable to children. This breaks the force of reprimands and renders them fruitless.

"8. We should avoid exciting the spite of children by the harshness of our language, their anger by exaggeration, their pride by marks of contempt.

"9. It is necessary always to show children a substantial and agreeable end which may hold them to work, and never pretend to force them by a direct and absolute authority.

"10. We should run the risk of discouraging children if we never praised them when they do well. Although praises are to be feared because of vanity, it is necessary to make use of them to encourage children, without cultivating that vice.

"11. Rewards are not to be neglected for children, and although they are not, any more than praise, the principal motive to make them act, yet both may become useful to virtue, and a strong incentive to its practice."

Horace Mann, in his "Lectures on Education," in reference to this subject says: "Yet great as the evil is, I admit that it is less than the evil of insubordination or disobedience. It is better, therefore, to tolerate punishment, in cases where the teacher has no other resource, than to suffer insubordination or disobedience in our schools. Yet how infinitely better to secure order and proficiency by the power of conscience and the love of knowledge—to supersede the necessity of violence by

moral means. This is already done in a considerable number of schools; I trust it is done, with regard to some scholars, in every school; that is, I trust there are at least some scholars, in every school in the Commonwealth, who never know the degradation of the lash. I trust there is no teacher with such a vacuum of good qualities and such a plenum of bad ones, as to create the necessity for indiscriminate and universal flogging. What, then, ought teachers to do? I answer, they should aim to reach those higher and higher points of qualification, which shall enable them to dispense more and more with the necessity of punishment. If there is any teacher so low in the scale of fitness or competency as to feel obliged to punish every day, he should strive to prolong the interval to once a week. If any teacher punishes but once a quarter, he should strive to punish but once a year."

Editorially speaking on this subject, the *New York Medical Record* says, "The question of corporal punishment in schools has been much discussed lately in Germany and Switzerland, and the Canton Berne has come to a decision in the matter. *The Ethical World* considers the new law a compromise between the flagellants and the anti-flagellants. It prescribes the use of the cane for grave faults such as indicate moral perversion; repeated

lying is given as an instance, and it is expressly forbidden to punish for want of application. Girls are not to be punished physically at all."

Certain forms of punishment are never to be tolerated, such as pulling or boxing of the ears. Serious damage has time and time again been done by teachers who, in their haste, have inflicted punishment in this manner. Slaps or blows upon the head likewise cause at times grave discomforts which persist for some time, such as dizziness and headache. It is well to remember, as Dr. Bristowe says, that there are some parts of the body that seem to be made for chastisement; and he speaks of the "posterior aspect of the human form divine." There is nothing so demoralizing to discipline as for a teacher to strike such a blow in anger and then spend the following hour in coddling back the same child to good nature. If corporal punishment is to be inflicted, it should not be done at the time of the offense, but later, when all traces of anger that might have existed shall have passed away.

Keeping in at recess and after school is not a right means of punishment, as all agree that the school hours are sufficiently long and fatiguing. Such tasks as standing for long periods should not be imposed on growing children, as long continued standing conduces to stooped shoulders and curvatures of the spine. Committing to

memory or writing long extracts accomplish but little in a corrective way. The most satisfactory means of correction with many pupils will not be in imposing difficult tasks at the expense of bodily energy, but the deprivation of certain privileges and pleasures that are accorded their better-behaved fellows.

Before punishing for want of application the teacher must satisfy herself of two things: first, that the task be not greater than the ability; and secondly, that there is no bodily defect which unfits the pupil for school work, such as defects of eyes or ears, or any abnormalities, such as adenoid growths in the throat.

CHAPTER XVI

SICKNESS AND ACCIDENT IN THE SCHOOLROOM

In considering ideal conditions in the schoolroom that tend to the prevention of sickness and accident, it is but a step away to dwell for a moment on what is first to be thought of when such complications arise in school. It is a wise thing for a teacher to know what to do and what not to do,—to know her own real limitations.

Ordinarily if “a little knowledge is a dangerous thing,” then a little knowledge of medicine and surgery is doubly dangerous; but in the government of hundreds of children gathered under one roof and engaged at times in rough games, accidents are sure to occur and the teacher is always the first one to look to in such emergencies. The same applies with equal force to the minor ailments of children during the school hours.

With sickness the teacher may use such natural means as her knowledge directs, like applications of hot or cold water, vigorous rubbing, recumbent posture, or removal to a quiet room, but she should never use medicines with any of the pupils. The giving of medicine is entirely be-

yond her province, and though always done with good intent may sometimes lead to unpleasant complications. Reference is made principally to the use of headache pills, powders, or capsules which are in such common use, yet all of which contain dangerous drugs.

Headache may be treated by removal from the main room, which is often apt to be overcharged with impure air, and by applications to the forehead of cold water, and of smelling-salts to the nostrils, with dismissal if the pain persists over a half-hour. Injury to the eyes may be the cause of constantly recurring headache; often changing the seat to give more favorable light will be of benefit.

With toothache and earache it is not wise to use anything but applications of hot cloths externally. If this means be not successful, other means of relief should be sought outside the schoolroom.

Fainting is a common occurrence in schools, but usually is of only momentary importance. A child who has fainted should be immediately taken from the presence of the other pupils and laid down with the feet several inches higher than the head. The clothing should be loosened and the face and hands bathed in cold water. Within five minutes there should be some signs of returning consciousness, shown by muscular movements and return of blood to the face.

Fits or convulsions are less remediable, occupying a regular interval and being little influenced by outside treatment. They are usually a form of epilepsy, most often what is called "*petit mal*," and when encountered at school should be treated like fainting spells. Whatever measures are resorted to will do little beyond serving the useful purpose of keeping those about employed in doing something. With many cases of epilepsy it is not advisable to send the patient to school at all, as attacks then occur with greater frequency; but numerous cases just on the border line where the spells are infrequent and mild are found, that do well at school.

Attacks of hysteria, such as immoderate laughing or crying without cause, are difficult to handle. They require a firm will to combat their display and never should be given any coddling or petting.

When one is sunstruck or overcome with the heat it is advisable to secure as speedily as possible a physician's services. In the meantime, the patient should be removed to a shady spot, the clothing loosened, and applications of cold water and cold cloths made.

In cases of frost-bite, which usually affects the ears, hands, or feet, the affected portion should be vigorously rubbed with snow or ice water and heat should be applied only very gradually.

For accidents it would be wise for a teacher to keep on hand such articles as a few bandages, some absorbent gauze and cotton, vaseline, and a solution of carbolic acid, one part to 100 of water. Many minor accidents could be looked after easily with such dressing at hand. A teacher should be everything to the child at school that the mother is at home.

Bruises and many cuts, if they seem to be of no depth or importance, can be bandaged at the time of accident. The immediate bandaging of bruises about the head will give relief and prevent future swelling.

A dog bite should at first be thoroughly cleansed, and then cauterized by a surgeon.

Burns, unless of a very minor degree, should be treated by a surgeon after a preliminary application of vaseline has been made.

Nosebleed is best overcome by placing the patient in a sitting posture, and applying pressure to both nostrils without any effort at blowing. If persistent, there are a number of other means to be used. Raise the arms above the head, apply ice to the nostrils and to the back of the neck, immerse the lower limbs in hot water to the knees or bandage them. Hot water or ice may be introduced into the nostrils. Should the use of these expedients not suffice more skillful treatment may be required.

Hemorrhage from any bleeding vessel is best controlled by applying a compress of a folded towel, preferably soaked in hot water, to the affected part. If one of the larger vessels of the limbs is severed, more heroic treatment is necessary. Then the first thing to do is to get at the source. If necessary cut the clothing away and apply compression by means of a tourniquet, which may be quickly improvised by tying a handkerchief or bandage about the leg above the injury, inserting a stick between the handkerchief and limb and twisting the stick about until the bleeding stops. Sometimes where the hemorrhage is from a vein, the bleeding continues until a tourniquet is applied to the distal side of the wound.

Where a limb is injured and a fracture, dislocation, or sprain is suspected, put the limb to rest by attaching it to some form of a splint and send for surgical aid. Do not allow the limb to be pulled or manipulated in any way, as it will do no good and cause great pain.

When foreign bodies, such as bits of dirt and cinders, get into the eye, forbid the child to rub it. Attempt to cleanse the eye with cold water holding the two lids separated with thumb and forefinger; or the substance may be removed by drawing the upper lid down over the lower lid. If one is skillful enough, the upper lid may be rolled over a pencil and search easily made for

the offending substance, which may then be removed with a clean silk handkerchief.

Foreign bodies in the ear are only to be removed by syringing with warm water. Sometimes flies and other insects crawl into the ear, causing great buzzing and discomfort. In such cases, if a lighted candle or lamp is held at the ear the insect will usually see the light and come out. When this fails, a few drops of warm olive oil or glycerine dropped into the ear will suffice.

Where a school is in the vicinity of a river, as is often the case, drowning accidents are by no means uncommon. Whenever a person is removed from the water in an unconscious and asphyxiated state, quick action is needed. It is impossible to have a number of rules at the finger ends to use, but a careful perusal of the following method, known as Sylvester's method of treatment of asphyxia from drowning, gives general ideas which should not be forgotten :

Remove from the mouth and nostrils all obstructions to the free passage of air to the lungs ; free the body from any clothing that binds the neck, chest or waist ; turn the body over upon the face for a moment, thrusting a finger into the mouth and sweeping it round, to bring away anything that may have accumulated there. Then lay the body flat on the back, with something a few inches high under the shoulders, so as to cause the neck

to be stretched out and the chin to be carried from the chest. Draw the tongue well forward out of the mouth and let it be held by an assistant. (If there be no one present, a pencil or small stick may be thrust across the mouth on top of the tongue and behind the last teeth, to keep the mouth open and the tongue out of the throat.) Place yourself on your knees behind the head, seize both arms near the elbows and sweep them round horizontally, away from the body and over the head, till they meet above it; give a good, strong pull, and repeat every few seconds. After this, return the arms to their former position alongside the chest, and make strong pressure against the lower ribs, so as to drive the air out of the chest and effect an act of expiration. This need occupy but a second of time.

This plan regularly carried out, will make about sixteen complete acts of respiration in a minute. It should be kept up for a long time, and not abandoned until the heart has ceased to beat. It should be remembered that cessation of the pulse at the wrists amounts to nothing as a sign of death; and life is present when only a most acute ear can detect the sound of the heart. In a moderately thin person, deep pressure with the finger-ends just below the lower end of the breastbone may sometimes reveal pulsation in the aorta when it cannot be found anywhere else.

CHAPTER XVII

THE TEACHER'S HEALTH

As the teacher lives in the same atmosphere as the child during school hours, what is beneficial to one is equally so to the other; but in many respects conditions are vastly different. The bad air, the poor light, and the oppressive heat are felt by both, but with the teacher there is the additional sense of responsibility and a continuous and wearing nervous strain.

The advent of specialization in school work divides the responsibility somewhat, but nevertheless the teacher must needs be a paragon of all virtues. She must be strong and of good disposition. If not strong and often ill, the school work suffers from the numerous changes in teaching and governing. If the teacher be nervous or irritable, she will do harm to the dispositions of the children by keeping them in a continual state of anxiety. A physical examination should be demanded of every applicant for a teacher's position. The following are important points:

I. There should be no physical defect, such as curvature of the spine. One so affected, howsoever qualified

mentally, is not a desirable candidate. Her physical strength would naturally be below par and the effect of such a deformity upon young children would not be good.

II. The heart and lungs should be normal and free from organic disease. This is essential for good bodily strength which will be needed to keep the school work up to the standard. A sickly teacher is a listless teacher.

III. The eyes and ears should be examined for defectiveness. Faults in the eyes can in most cases be easily corrected by proper glasses, but a fault in the ears is more serious. If existing to any great degree it should be a permanent bar to an applicant's appointment.

IV. A good speaking voice is needed in order that the instruction may easily be heard in all parts of the school-room. A high pitched, harsh voice grates unpleasantly on the children's nerves.

V. There should be a general summing up of the entire system, just as the medical examiner of a life insurance company decides whether an applicant for a policy is a good risk. If there be lowered vitality in any respect, if the applicant would prove to be a poor risk for an insurance company to assume, she will prove to be a poorer risk for the school board.

VI. A careful study should be made of the applicant's disposition, in order to weed out all victims of the great American disease of "nerves," whether sufferers from

simple nervousness and irritability or from the more pronounced form of nervous exhaustion.

A teacher who finds herself unable to restrain her nervousness and irritability should be conscientious enough to seek another occupation, as this is proof positive that she has not the requisite qualifications to preside over children.

The most common afflictions among school-teachers are nervous diseases, dyspepsia, anaemia, and tuberculosis. The medical inspector should be empowered to examine all teachers yearly and to exclude from school work any suffering from tuberculosis. The teacher, more fortunate than many people in other walks of life, has a considerable space of time at her disposal. A portion of this time,—at least an hour—should be daily spent in exercise. This is the great remedy for the common condition of “nerve tire.” No medicines will so effectually wipe away this feeling of exhaustion as a romp through fields and woods, a spin upon the wheel, a game of golf in the summer, or an hour’s indoor gymnasium work in the winter. Let the school teacher remember that as the nervous force is in such constant demand it should be conserved in every possible manner. When symptoms of fatigue and nerve strain are felt, avoid the use of such medicines as nerve tonics, which will in the end do only harm, and seek relief in exercise or periods of rest.

It is wrong, however, for the teacher to become imbued with the idea that hers is the most exhausting and life-destroying occupation known. Some writers of late have dilated upon this idea and one superintendent of schools goes so far as to say that five years' actual service will be sufficient, in the majority of cases, to ruin a teacher's health. But experience and statistics will not bear this statement out, as school teachers enjoy an especially favorable place in the tables of expectancy of life. Though consumption claims the largest number of victims, even this disease is proportionally less frequent among teachers than among persons of any other occupation. Diseases of the nervous system rank second, and heart disease third, as causes of death. But even so, the Eleventh Census of the United States gives the death rates of male teachers as 9.28 per thousand, and of female teachers 4.32 per thousand, and further says that the death rate of teachers is much less than the average rate for all other selected occupations. On the whole, then, "we must take the rough and the thorny as well as smooth and pleasant, and a portion at least of our daily duty must be hard and disagreeable, for the mind cannot be strong and healthy in perpetual sunshine only, and the most dangerous of all states is that of constantly recurring pleasure, ease, and prosperity."

CHAPTER XVIII

DEFECTIVE CHILDREN

IN all civilized communities, there will be found a certain proportion of children, about one to every five hundred, who from one cause or another are not the mental equals of the average child.

Seguin defines this class as children in whom is present functional torpidity or backwardness of the nervous apparatus, but who are not sufficiently abnormal to be classed as idiots or imbeciles. They are commonly spoken of as backward children. Among this class there are many subdivisions, leading from the one of simple retarded mental development to well-defined cases of idiocy and imbecility.

A. There is a large class who have no organic or functional disease, but who are extremely slow in the process of mental unfolding. In school, these are the extremely dull pupils who find all forms of mental exertion difficult. They are particularly troubled with arithmetic, less so with reading and writing. Such children do not learn to creep, walk or talk until a much later period than

the normal child. At the age of ten years they usually have the mentality of a child four or five years of age. They are apt to be the butt of ridicule of their playmates and are often teased and hazed beyond endurance.

Much can be done in developing these children under proper environment. They should be in a school for backward children, under the care of a teacher who has proper interest and sympathy with them.

Their progress is necessarily slow and the tasks assigned to compensate with their enfeebled brain power should not be more than one-fourth the regular tasks. It is impossible for one teacher to care for and do justice to more than ten such pupils.

The superintendent of the schools of Batavia, N. Y., made use of an interesting experiment for the benefit of backward children, which elicited favorable comment from the educational and medical professions. Finding that a certain proportion of the pupils experienced a great mental and physical strain in trying to keep up to the ordinary school standard, he put into practice a very rational plan to stop, as he said, "this killing of children." He advised in every room an extra teacher whose sole efforts were to be applied in helping those who were constantly behind their regular classes. The experiment has been tried elsewhere with the same striking success that makes one wonder that so excellent an expedient had not long since been in use.

The most interesting features of the "Batavian experiment" are that the scholarship was improved and the health of the child was noticeably benefited. The mental load was made lighter for the child and naturally the physical strain was lessened.

It was found that under the new régime a far greater number of pupils each year continued their school work, and in the high school six times the former number of pupils remained to graduate. The experiment deserves especial study and imitation. The matter of expense would readily be borne in consideration of the helpfulness and healthfulness that would soon be apparent.

B. There are those children who are defective by reason of the loss of one or more of the special senses,—as the blind, the deaf and the dumb. Fortunately there are provided in all states excellent institutions for the care and education of these afflicted ones. With this class of defectives far better work will be had when the entire control of the child is given up to the institution.

C. The morally defective are that class in which the "moral sense which causes a human being to weigh, consider and approve or disapprove his own conduct, is blunted or absent."

They are especially difficult to control, not susceptible to reproof and training, and punishment in their case is of no avail.

Maudsley speaks of this class as persons "who are born with an entire absence of the moral sense, destitute even of the possibility of moral feeling. They are as truly insensible to the moral relations of life, as deficient in this regard as a person color blind is to certain colors, or as one who is without ear to music is to the finest harmonies of sound." They are ordinarily beings of good physical health, but for their own good as well as public good they should have the constant and restraining influence of an institution.

D. There is a type with all the special senses, but without the power of attention. Such children are singularly difficult to instruct, for the most painstaking labors and frequently repeated suggestion will be without avail.

E. Another class is distinguished by being deficient in will power. Nervousness, caused by overstudy and overwork, sometimes causes this paralysis of will power, and it is often noted at or about the period of puberty. This loss of will power is a very constant symptom associated with aggravated forms of hysteria. Such cases are capable of great improvement, but only after long periods of rest under a helpful régime of exercise and fresh air. They are poor subjects for school work and very little mental work should be expected of them.

F. There is another class, comprising children who possess normal senses but lack the power of memory,

failing to retain even for a short time recent instruction. This condition sometimes follows debilitating sicknesses, injuries and epilepsy.

It is a condition most often met with in later child life, and has little tendency towards improvement.

G. There are then the many cases of imbecility and idiocy wherein exist defective or arrested cerebral development.

There is no known means of reorganizing a defective brain; but much good can be done by tactful teachers in a properly equipped institution. With many cases of all classes enumerated some improvement can be made. Many if taken in time can be made to be helpful members of society rather than dependents. The ordinary public school has no opportunity for training these cases. The work must be carried on in special schools or institutions under civic aid and civic law. Every city should have its school for backward children, every state should have its homes for the more helpless and dependent. Many of the children are so slightly below the standard that they may receive satisfactory training at home supplemented by daily attendance at a special school. The training is principally along the physical side; indeed, this is the most promising avenue open to improvement.

Dr. Martin W. Barr, chief of Pennsylvania Training School for Feeble Minded Children, says, "The motto of the schools—'We learn by doing; the working hand mak-

ing strong the working brain,—shows manual training to be the basis of the scheme of development, varied for each grade to suit the intelligence."

In the Elmira Reformatory excellent results are reached after this same plan of developing the brain from the physical side. The defectives are divided into three classes: 1, those who are intellectually weak but have powers of self-control; 2, those who are bright but lacking in self-control, and 3, those who are weak and also lacking in self-control. Physical training and manual training are the successful means of their improvement, which is especially apparent in the second class named.

Too much must not be expected of any form of training for the mentally defective.

No system can make brains; the improvement will be apparent only upon the limited amount that are found at hand.

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